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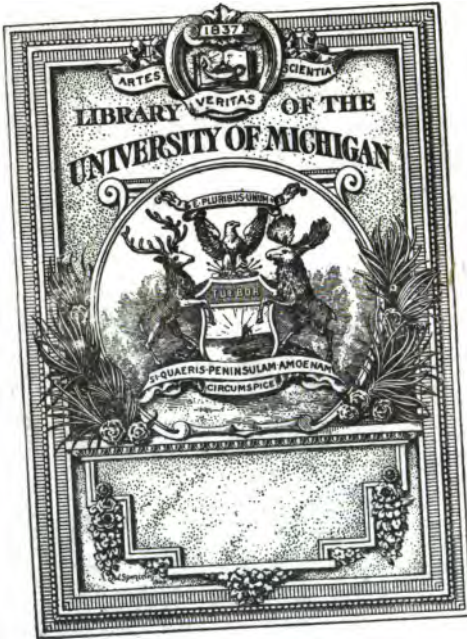
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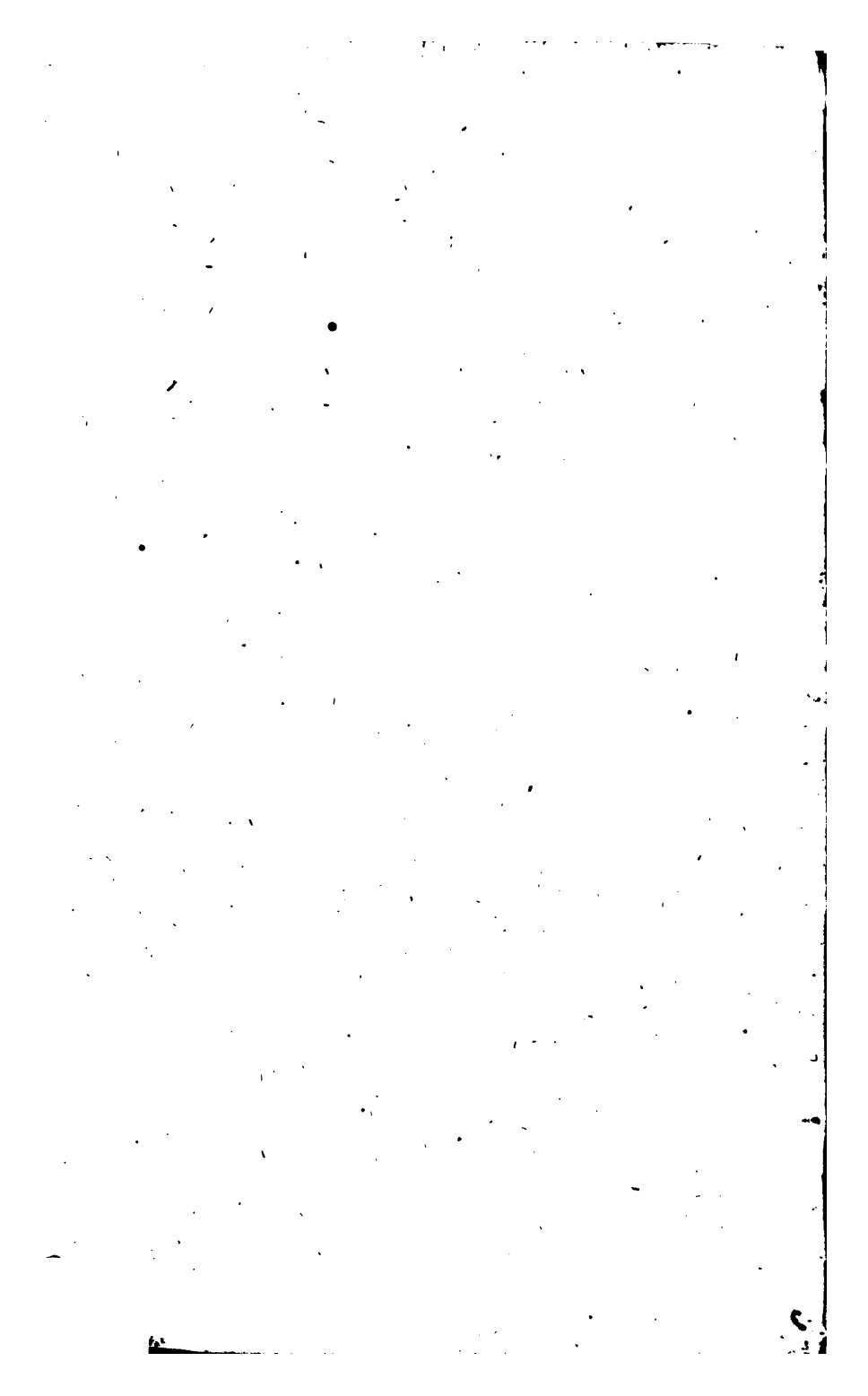
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A GENERAL
TREATISE
 OF
HUSBANDRY and GARDENING;
 Containing a New
SYSTEM of VEGETATION:
 Illustrated with many
OBSERVATIONS and EXPERIMENTS.
 In Two VOLUMES.

Formerly publish'd Monthly, and now methodiz'd and digested under proper HEADS, with ADDITIONS and great ALTERATIONS.

In FOUR PARTS.

Part I. Concerning the Improvement of Land, by fertilizing bad Soils. Of stocking, of Farms with Cattle, Poultry, Fish, Bees, Grasses, Grain, Cyder, &c.

Part II. Instructions to a Gardener, wherein is demonstrated the Circulation of Sap, the Generation of Plants, the Nature of Soil, Air and Situation. Of the Profits arising from planting and raising Timber.

Part III. Of the Management of Fruit Trees, with particular Observations relating to Grafting, Inarching and Inoculating.

Part IV. Remarks on the Disposition of Gardens in general. Of the Method of managing Exotick Plants and Flowers, and naturalizing them to our Climate; with an Account of Stoves, and artificial Heats.

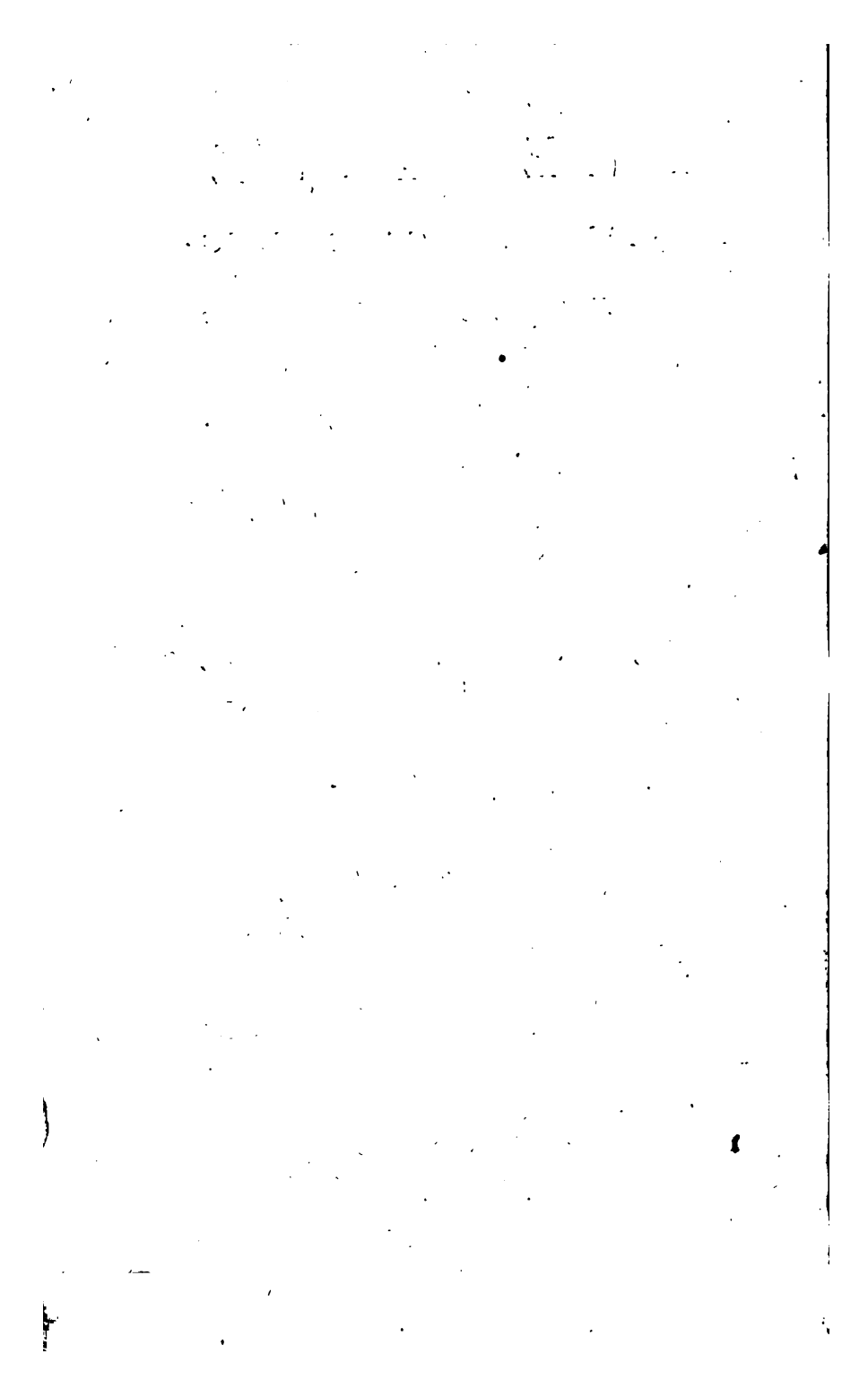
Adorn'd with CUTS.

By ^{hand} R.^s BRADLEY, Professor of *Botany* in the University of *Cambridge*, and F. R. S.

V O L. I.

L O N D O N:

Printed for T. WOODWARD, at the *Half-Moon* over against St. *Dunstan's* Church in *Fleetstreet*, and J. PEELE at *Locke's* Head in *Pater-noster* Row.
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12 D 13 2 M



T O

The Right Honourable the
Lord *CARTERET*,
One of His M A J E S T Y ' S
Principal Secretaries of
State.

M Y L O R D,



T H E favourable Re-
ception which some
of my former Works
have met with, and the En-
couragement I have had to
A 2 pursue

Reclass. My V P. 10-19-36

Dedication.

pursue my Studies in the useful Parts of natural History, has prompted me to undertake the Task which I now venture to lay before your Lordship.

The Improvement of Land, and the Study of Agriculture, have greatly contributed to render our Nation famous above all other Countries ; but whether that is owing more to the natural Industry of our People in general, or to the good Reasoning of particular Persons, is doubtful : If it proceeds from the former, there is room enough to hope for its Advancement by the latter ; or if this useful Art has

Dedication.

has made its Way thus far by the Labours of Experimental Philosophers, 'tis Encouragement enough for them to continue those Studies, since we neither want People nor Industry to bring their Designs into Practice.

But as every Art, however extensive or useful, demands the Protection of the Great, to make it circulate in the Minds of the Publick, so I am confident there is no surer Way of recommending these Papers to the World, than by introducing them under the Patronage of your Lordship, whose extensive Genius, wise Conduct, and Love for his

A 3 Country,

Dedication.

Country, is justly rewarded
with the Favour of the Prince,
and the good Will of the
People.

I am,

May it please your Lordship,

Your Lordship's

Most Obedient,

Humble Servant,

R. Bradley.



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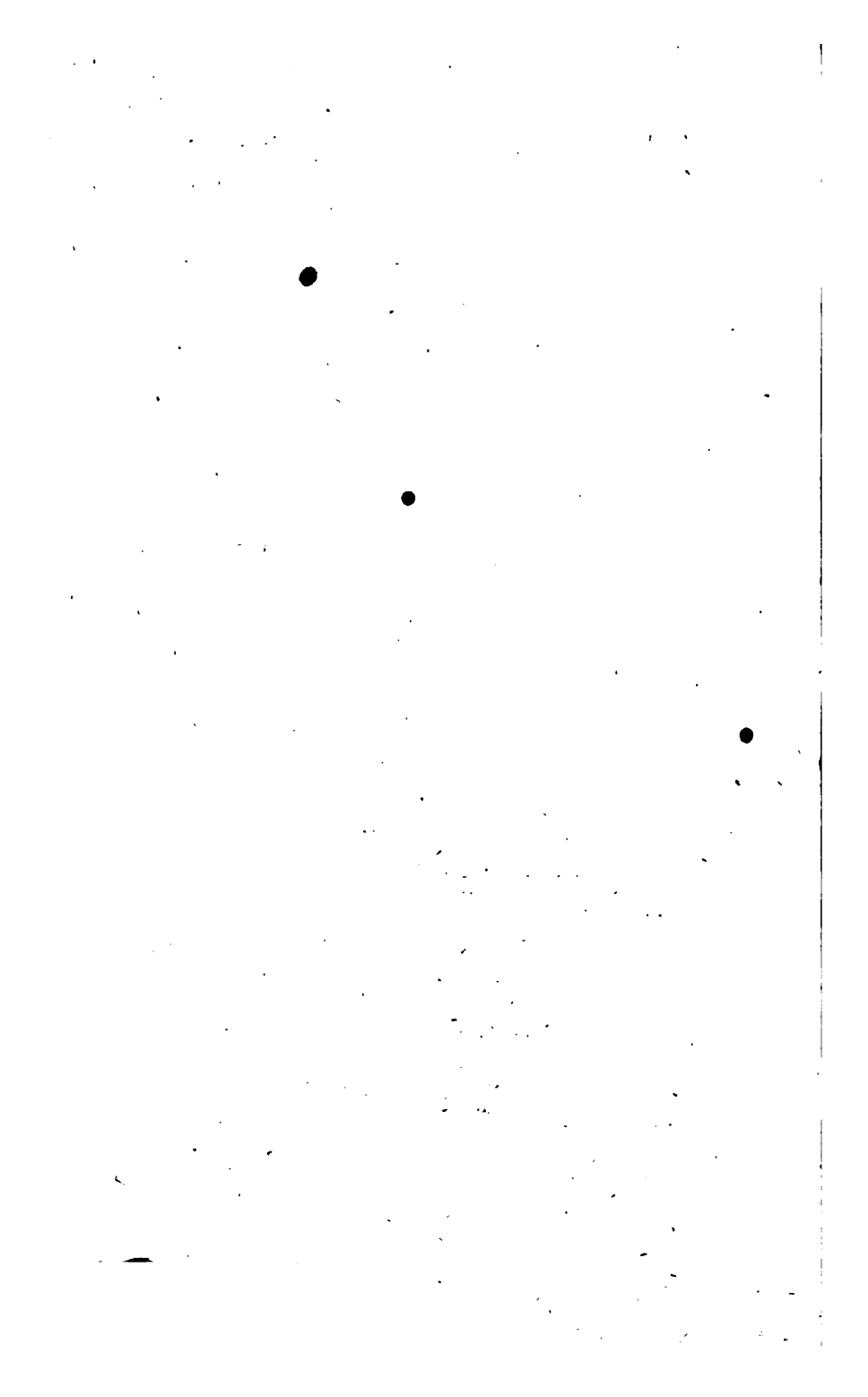
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A General





A General
T R E A T I S E
O F
Husbandry and Gardening.

P A R T I.

INTRODUCTION.



THE Design of this Work is to enquire into the Nature of such Lands as are most capable of Improvement, and to propose the most proper Method for fertilizing them: For although our *English* Husbandmen are allow'd by all Nations to have a superior Genius in Agriculture, pre-
B ferable

ferable to those in other Countries, yet it is rare to find one of them who ever attempts any new Discovery, or even can give any other Reason for what they do, than that their Fathers did the same before them.

This brings to my Mind the Observation of a very ingenious Man, who had maturely consider'd this Case: He observes, that the Country People generally pick out such of their Children to employ in Husbandry, as they judge are not worthy of good Education; and whom they suppose have so little Genius, that they are only fit to drudge in hard Labour: And 'tis likewise for the same Reason, says he, that we find so few good Gardeners among the Crowd of those who pretend to that Art. Husbandry and Gardening ought rather to fall under the Care of expert Philosophers, and reasonable Men, who have Judgment enough to remark the different Effects of different Seasons; the Situation of the Lands they are to cultivate; the Depth and Quality of their Soils; the easiest Ways of meliorating Land, by mixing one Soil with another; or how to appoint to each natural Earth its proper Plant; and not as some do, be too positively confirm'd by Custom to make new Experiments, which might, with small Trouble and Expence, be done in By-places, and might tend to their own and the Publick Good.

'Tis partly for these Reasons, we observe so many large Tracts of Ground lying now in a manner waste and unprofitable: And as I have no greater Pleasure than in making my Observations and Remarks in this Way of Knowledge, I judge that my present Undertaking will be acceptable and beneficial.

In

Husbandry and Gardening. 3

In this Work, I shall describe the several curious Contrivances for draining of Lands, and forcing or raising of Water; and also for meliorating and refining it, when we are possess'd of a sufficient Quantity of it. This I suppose may prove useful in many Places, and be of no small Advantage to the ingenious Authors and Makers of such Inventions, whose Names I shall mention with Honour, as I have Opportunity of knowing them.

The Correspondence I have already fix'd, and what I still expect from some of the first Class in this Way of Study, will sufficiently (with my own Remarks) furnish out such a Work as I now design, and contribute to the general Improvement of Lands; which will be like a new Acquisition of Territory to our Nation, and perhaps be one Means of restoring our Credit, and prove of Advantage to the Poor, by employing them in profitable and healthful Exercise.

Our Parliaments have already begun to enclose Commons; and I doubt not but most of the Commons in *England* might be brought into the same regular and happy State, provided the Poor (who have generally the Right of commoning) have severally their Parcels of Land determin'd by Ballotting, or any other Way, where Bribery or particular Interests cannot take place. The Forests likewise might turn to a good Account, were the Lands parcell'd out, and every Tenant oblig'd to plant certain Quantities of Timber for publick Advantage: This, in my Opinion, would be a sure Means of supplying the Nation with that valuable Commodity, which at present is so scarce, that its Price is above one third Part more than what the

same Measure was sold for twenty Years ago, as appears by several Accounts of that Date, compared with those of this present Year, 1721.

But whoever takes a Survey of the Forests, will find sufficient Reason to support what I say, without having recourse to such Accounts: They will find not only a Want of Timber in those Places, but even the Prospect of a Supply for the future cut off by idle People living in their Neighbourhood; who, rather than be at the Expence of a little Firewood, or some trifling Tool or Utenfil, will destroy young thriving Plants of Oak, which perhaps had already gain'd twenty or thirty Years of Time, and were in a prosperous State; and this we find is still practis'd, notwithstanding the many Acts of Parliament, made in several Reigns, to prevent this Destruction of Timber-Trees.

But 'tis with no small Pleasure, I observe some Noblemen and Gentlemen begin to enter into the Reasonableness of making Plantations of Timber, and preserving and weeding such Woods as their Ancestors were wise enough to erect. The Plantation and Care of Timber is like buying the Reversion of an Estate; for a little Money expended, we become Heirs to great Sums.

This Case therefore, which carries so much Advantage with it, I shall propagate as much as possible in this Work; having several Observations and Letters now by me of Importance, which relate to the Subject; wherein there are not only many Discoveries tending to the Improvement of Woods and Timber-Plantations, but an Account of the Value of Timber-Trees, whereby we may compute the Increase of Worth in such Trees from one to twenty Years: And
I can-

Husbandry and Gardening. 5

I cannot avoid soliciting every Gentleman, who has kept such a Register, to communicate what has been observ'd in that Way, with some Account of the Soil, Situation, and Time of Planting, if possible; that from many Instances we may come near a Certainty of the Growth and Value of Timber, and give the Publick a View of how much every Acre of Wood-Plantation may grow in a Day, a Week, a Month, or a Year, having due Regard at the same time to the Sorts which are growing, according to their Proportion of Difference; not unlike what I have heard, that Herbs grow in Pence, and Shrubs in Shillings, while Timber grows in Pounds; but this I shall explain more fully in another Place.

As for Gardens, I shall mention them with the rest, as Occasion shall afford me sufficient Variety of Observations to improve them in their several Orders; and remark how far the Skill of the Workmen employ'd in them, makes them excel the neighbouring Gardens: And, for the better Information of my Reader, shall give such Remarks upon the Weather, and the Produce of every Month, as may be serviceable and worthy the Notice of all such as are either Husbandmen or Gardeners: For one of the surest Methods to be taken for understanding Agriculture and Gardening, is to enquire into the Course of Seasons, and their Consequences.

In this Work I shall likewise have occasion to mention the Use and Improvement of Poultry, and some Sorts of Cattle, about a Farm; for it is not only the making of Plantations, or the tilling or sowing of Land with proper Crops of Plants, or Grain, which enriches an Estate, there is also great Profit to be reap'd by grazing

and feeding Cattle and Poultry; and without they are rightly understood, a Farmer may lose a great Part of those Benefits which the judicious Husbandmen enjoy. Nor indeed is the Knowledge of Pond-fish, and the Method of improving them, to be neglected: They carry their Value with them, even tho' such Ponds lie near the Sea. I have often heard Gentlemen regret the Want of such Conveniencies.

In some Places I know it has been thought impossible ever to stock their Ponds with Carp, Pike, Tench, or such like, because there were not any of those Fish near enough to be brought alive to the Places desir'd; but there is no Difficulty in such a Case, if we can but get a good Quantity of the Spawn of those Fish, they may be transported for several Days Journey in Barrels of Water, and stock our Ponds, if the Spawn has a due Quantity of Air while it is in the Barrels. I remember an Instance of it, where a Gentlemen of my Acquaintance had long desir'd to store his Pond with Tench; he try'd in vain to bring them a Day's Journey alive; but at length he was advis'd to provide a large Quantity of Spawn of those Fish, and send it into the Country thus barrell'd up, which he did, much to his Satisfaction; for in a short Time he had so great a Quantity hatch'd in his Ponds, that he was capable of supplying all his Neighbours. Besides, there is this Advantage in storing Ponds by Spawn, that the Fish become natural to the Water, and thrive in it much more than if they had been accustom'd to a Water of another Sort.

I have also known that some Gentlemen have had Curiosity enough to transport the Eggs of extraordinary Land and Water Fowl some hundred Miles, and thereby stock'd their Estates with

Husbandry and Gardening. 7

with Varieties of Game; but in such a Case we must always have Regard to the Nature of the Fowl, that such as are of the Water Race, are hatch'd and brought up under those kinds as love the Waters, such as Ducks, Geese, &c. and Pheasants, if possible, to be hatch'd rather under Turkeys, than Hens of common Poultry; for the Food of Pheasants is much nearer that of the Turkey than of the common Hen, and the Time of Incubation is the same with the Turkey.

Of Water Fowls I find the greatest Variety about the Fern Islands near the Coast of *Northumberland*, and by the Sea-side in *North-Wales*. From the first, one of my Acquaintance has more than once receiv'd Eggs of above thirty different kinds, box'd up in Bran, which he hatch'd and brought to that Perfection, that his Pools are now plentifully stor'd with them, altho' they have not the Advantage of salt Water.

The Breeding of Pheasants is generally thought to be so difficult and expensive, that few will undertake it; which perhaps may be, because the common Method, prescrib'd for breeding this sort of Fowl, is so unnatural to them, that we seldom have more than one fourth part of the young ones come to good; and yet I find 'tis still practis'd in some famous Pheasant-tries, where the Expence amounts to much more than the Value of the Fowls that are produc'd: But in this, as well as other Things, we find that the more we swerve from Nature's Rules, we are more distant from Truth and Profit; and too frequently we find Men involv'd in Error, when they prefer Art to Nature. It is observ'd by Men of Judgment, that the most useful Things were in Nature before they were discover'd, and that no Art is just, whose Foundation is not natural.

tural. One Instance of this may be pretty well explain'd by what I have observ'd in the breeding of Pheasants about my own House: I bought a good Number, with a Receipt for their Management according to Art, *viz.* that they should be fed with Paste, made with Pollard, Milk, and a common Hen's Egg, which, as I was told, would make them lay plentifully; now, whether by this Means, or according to the Nature of Fowls, which have their Eggs constantly taken away, they were prompted to lay more Eggs than natural, I know not, but every Hen brought me thirty at least; so that I had always Eggs enough from every Pheasant, to set under two Hens of the common Poultry; however, with all the Care I could take, I had not a fourth part of the Eggs came to the Perfection I desir'd, 'till one of my Hen Pheasants, by Accident, got abroad, and stole her Nest, which she kept undiscover'd 'till she brought out fifteen young ones, that I suffer'd to run with her two or three Days without Controul; but I was ignorant enough then to imagine, I could contribute to their Welfare, by retrenching their Liberty, and giving them richer Diet than they naturally fed upon, besides my preserving them from Vermin: I therefore took the Hen and her Young, at Roosting-time, and put them in a Place of Shelter, but the Morning following, I found my Mistake, the Hen had destroy'd every one, by wounding them in the Head with her Beak. From hence I learnt how necessary it is to treat all created Bodies in the way most natural to them; and I have found since by Experience, that where pinnion'd Pheasants have had due Liberty allow'd them, and not more than one Cock to seven Hens; they have brought their
Young

Husbandry and Gardening. 9

Young to Perfection for a trifling Expence ; but the common way prescrib'd, has always the same Share of ill Fortune.

There is one Thing more which requires our Observation, and demands our Study, relating to the Use of Water, where the Ground about it is upon a Flat ; where this happens to be under Government, so as to be confin'd within proper Bounds, it will turn to extraordinary Advantage to the Proprietor. A Case of this Nature is now bordering upon an Estate of the present Earl of *Warwick*, which lies between *Kensington* and *Hammer-smith* ; where we find a Common-sewer, reaching from the *Thames* as far as the *Oxford Road* near *Acton*, and crossing the great Road from *London* to the West of *England* ; all the Land on one Side is belonging to his Lordship. This Shore has been made navigable for near a Mile in length, by private Hands ; and was his Lordship dispos'd to continue it in the same manner to its Extremity, there is no doubt but his Lands would be' extremely improv'd, and probably be enrich'd by Buildings, and at the same time save the Wear of the Roads, and turn to the Farmer's Profit, who might by the Benefit of Water-Carriage supply their adjacent Farms with Necessaries at cheap Rates, and transport their Crops to the best Markets with Ease and Safety ; but especially if they consist of soft Fruits, as Strawberries, Cherries, or other kinds of tender Garden-Stuff, which is chiefly the Study of the Husbandmen thereabouts : We might add still the Advantage which might arise by bringing Coals and other cumbersome Commodities by Water, to the Inland Parts, which would save the Expence of Horse-flesh : But whoever understands the Benefits arising by making

making Rivers navigable, will easily conceive how useful Canals of the sort I mention would be to Gentlemen who have Landed Estates.

But there is another Benefit which may be reapt from Water where we have it under Command in high Situations, besides the Beauty it might afford in Cascades ; I mean that of Watering of Lands.

We have an Instance of this kind at *Mamhead*, the Seat of *Thomas Balle, Esq;* in the County of *Devon*, which, besides all the natural Ornaments that can be imagin'd or desir'd to render an Estate beautiful, has the Advantage of some Springs, lying several hundred Yards above the House and Gardens, upon so high an Hill, that I have been told by the Country People, 'tis the first *English* Land which the Sailors discover in their Way home from the Bay of *Biscay*.

On the Edge of this extraordinary Hill, the curious Gentleman beforemention'd, has directed the clearing and opening of two or three Springs which afford Water enough in the dryest Season to furnish large Reservoirs ; from whence, after a Fall of many Yards, the Water comes to a Level with the Top of another Hill, which is of the Figure of a Sugar-Loaf, and whose Base exactly backs his Garden, and defends it from North and East Winds. On the Top of this second Hill is room enough to make a Bason capable of containing more than one hundred thousand Tun of Water, so that there may be a sufficient quantity to furnish a Cascade for eight or ten Hours every Day ; the Height of this Hill is upwards of one hundred Yards perpendicular, which made me advise rather to have the Water fall in Cataracts of about twenty-five Foot apiece, than to slide gently over Steps ;
each

each Cataract to be at least fifteen Foot wide towards the Top, and to spread in Sheets about forty Foot at the Bottom ; for about the middle of this Hill there is the Command of two powerful Springs, which flow perpetually, and may strengthen the Body of Water which comes from the Top, so as to play three times as much as the upper Reservoirs can do ; besides, if the upper Reservoirs should want Water, the second of themselves would give a good Appearance.

To this we may add, that the Hill I speak of is cloath'd with well-grown Timber-Trees of most kinds, and border'd at the Bottom next the Garden, with a Gallery of tall Elms, cut (as the Gardeners term it) Fan-fashion ; thus we may say the Beauty of this Hill is rather beholden to Nature than the Study and Labour of an Artift ; and yet there is no Figure which one would sooner covet in this Way, than a Cone or Pyramid, to shew us a compleat Pillar of Water in Cascade.

But as much as this is beautiful and agreeable, for a little Expence, it carries an extraordinary Benefit along with it, *i. e.* its Use in watering the better part of the Estate at pleasure, which, in some Seasons, will prove very advantageous, for Grass-Ground especially ; for in the Design of this Cascade, it is so contriv'd, that every single Sheet or Cataract of Water is to fall into a Receiver big enough to hold a large quantity of Water, which may, by a small Sluice, be let into a Channel that leads to the upper part of some Field or Orchard, so as to refresh the whole ; for the Grounds, as well Fields as others, which are within the reach of this Benefit, lie gradually sloping in such a manner as that every part of his Orchard and Gardens may partake of the Advantage

vantage of these Water-works ; which, for the most part, may be made to fall in finer Cascades than are commonly to be found in *England*.

While I am considering this Estate, I cannot help observing two or three things uncommon enough ; first, that the superficial Stratum of Earth is seldom more than nine Inches, before we meet with a red Rock, which, while it is under Ground, is very hard ; but it is observ'd in some Buildings which were made of it about forty Years ago, the Air has occasion'd it to moulder and fall to pieces, and yet tho' it has this Rock for a Foundation, the Estate is plentifully supply'd with valuable Timber of all sorts, planted for the most part by Sir *Peter Ball*, Grandfather to the present Possessor.

Secondly, That notwithstanding this Shallowness of good Soil, the ever-green Oak thrives there so well, that the Diameter of the Trunks measure above a Foot, though the oldest of them have not been planted (as I am inform'd) more than forty Years ; but indeed few of these grow so upright as one would wish, except one of them, which (perhaps came from Seed in the place where it stands) is about fifty Foot high, with a strait taper Stem without a Knot. I remember to have seen some Hogsheds made of the Wood of these Trees, when I was last in *Devonshire*, and brought some of it with me to Town ; the Grain of it is like the finest Wainscot, but it is so very hard to work, that I question whether we have any harder Wood of *English* Growth, unless it be Box ; and I am inform'd that the Cooper who made the Vessels I have mention'd, had almost double the Trouble in setting and working this Wood, that he usually had in working our common *English* Oak ; but I doubt not if he was to follow

follow the ingenious and useful Method, lately contriv'd by Capt. *Cumberland*, for softening and bending of Planks for the Use of Shipping, he would succeed much better: An Account of which I shall give my Reader in its proper Place.

But, *thirdly*, I come to take Notice of the Method us'd for transplanting of a large Number of ever-green Oaks, which were about thirty Foot high, and had stood in a Nursery about twenty Years, without any Culture; which, I believe, is the first, if not the only Attempt of this Kind, which has been practis'd with Success, and is purely owing to the good Judgment of *Thomas Balle of Mamhead, Esq;*

In the Year 1719, this Gentleman, early in the Spring, order'd these Trees to be taken out of the Nursery, with as much Earth about their Roots as possible, and to be convey'd with Care, to the Top of an Hill of considerable Height, where he had Holes ready prepar'd for them, and Banks rising near a Foot above the Surface, consisting of the superficial Earth about one Part, mix'd with red, rocky Soil: The chief Things he regarded in this Plantation, were to see them set no deeper in the Ground than they were before; to fix them well with Stakes, and give them Plenty of Water. The Trees thus planted, were near a Hundred: But lest this new Experiment should miscarry, he counterplanted the Avenue with *English Oaks*, with the same Care: But the Effect was very different; for I did not observe above four of the *Ilex* or ever-green Oak that fail'd, and there was hardly so many of the *English Oak* that liv'd; and I believe, in some Cases, large Trees may be transplanted with much more Safety than small ones,
if

if due Care be taken in their Removal, tho' indeed the Expence will be much greater. Before I leave this Place, it is necessary to observe how much this Plantation was beholding to a gentle and vegetative Air in its Situation, by lying open to the South Sun, and within two Miles of the Sea, which at that Distance yields very great Advantages, by affording a due Proportion of its Vapour to mix with the Land Air, even so as to keep off the Violence of Frost; for I suppose it is with Air as it is with Water, that the Salt Water of it self does not freeze, but the Parts of the Sea, which are near enough, and capable of mixing with large Rivers of fresh Water, will freeze, more or less, as they mix with the fresh Water; so I suppose that the Vapours arising from the salt Water, mixing themselves, more or less, with the Vapours arising from the Land, or fresh Water, defend the Body of the Air they mix with, in certain Proportions, from the Rigour of the Frost. As an Example of this we find, that in this Part of *Devonshire* the Snow will seldom lie upon the Ground above twenty-four Hours: In this happy Climate therefore I advise the planting of Vineyards of early Grapes, on the Sides of rocky Hills, such as the *Morignon*, *Munier*, and those Kinds which ripen in the open Grounds in the North Part of *France*; for from what I can judge of the *Devonshire* Clime, the Air is more benevolent than in those Parts of *France* which I have mention'd.

How necessary it is to consider the proper Soil, Air and Situation, in every thing we undertake in Husbandry and Gardening is very well set forth in the following Letter.

To Mr. BRADLEY, F. R. S.

S I R,

AS we have often had Opportunities of conversing about the Difference of Soils, and of the Temperature of Air, requir'd for the Production and Nourishment of Vegetables, I herè send you, as near as I can remember, the Sum of our Arguments, with some Remarks I have made upon them.

To begin then; you seem to be of Opinion that it was not the Soil or Earth it self which afforded sufficient Provision for the several Plants or Vegetables; that there were residing in every Earth, some agreeable Juices to nourish Plants of different Kinds; and as those Juices were more or less abundant in that Earth, or had different Qualities, so the Vegetables planted in it would be more or less vigorous: These Juices, or Salts, you suppos'd were furnish'd by the Air, and put in Action by the Sun; to prove which you referr'd me to the following Experiment, said to be *Helmont's*, related by Mr. *Boyle*, who dry'd two hundred Pounds of Earth, and planted a Willow of five Pounds Weight in it, which he water'd with Rain, or distill'd Water; and to secure it from any other Earth getting in, he cover'd it with a perforated Tinn Cover. Five Years after, weighing the Tree, with all the Leaves it had born in that Time, he found it to weigh one hundred sixty nine Pound, three Ounces; but the Earth was only diminish'd about two Ounces in its Weight. This Experiment I found, as you directed, in Mr. *Derham's* Phys. Theol.

p. 61. I have made some others of the same Kind, and find the Plant has little more Use of the Earth it stands in, than the keeping it fix'd and steady; but then, as Earths are more or less binding, the Salts or Juices proper for Vegetation have less or more Liberty to act. From Experiments of this Kind one might come to a reasonable Judgment how much a Tree encreases in every Year of its Growth, and how much it improves in Value; but I shall leave that to be consider'd more particularly by your self, only offering this Hint, that the Earth, after the Tree is drawn from it, must be weigh'd in the same State it was in when the Tree was planted in it: The fairest Way, I think, is to make it as dry as possible, in an Oven, at both Times; this would likewise lead us into many curious Speculations, as that the fine Body of the Air should become dense as Water in the Vessels of the Tree, and from that State be fix'd, and become solid as the Wood of a Tree. I think it is almost demonstrative, that the vegetable Nourishment is principally in the Air, from the foregoing Experiment; the two Ounces of Earth lost, might perhaps remain on the Sides of the Case the Tree was planted in, or upon its Roots, or in the Weight of two hundred Pounds I think two Ounces may easily be lost, unless both the Scales and the Weigher are very exact; or in the baking or drying of the Earth, there might be two Ounces more of Moisture found in that Quantity of Earth, one Time than another.

Thus supposing 'tis Air which feeds and nourishes Plants, and from the Instance you have given me of the Tree Sedum, which will take Root, and live, without Earth or Water, for
several

several Years ; I come to consider how much the different Changes and Alterations of Air work upon Vegetables. In the Example of a Piece of the *Sedum Arboreascens*, hung up at Mr. Fairchild's, at Hoxton, which you say shoots out its Roots when the Air thickens and tends to Rain ; this I have so far experienc'd, that I am perswaded it is constantly so ; and I have try'd other *Sedums*, which proportionally do the same ; but it is difficult to determine whether the different quantity of Moisture, contain'd in each of the kinds of them, may not, upon one certain Temperature of Air, be dispos'd to exert it self to the utmost of its Power in each respective Plant ; or whether, according to the different Textures of the several Plants, every one is not impower'd in its own Way to receive a certain impulse, or distinct nourishing quality from the Air, which the rest cannot equally share of. In some Conversation I have had with you, I remember you was of Opinion, that the Vessels of each distinct Plant were different from those in the others, and that those Vessels were in every Plant capable of filtering the Juices they receiv'd from the Air or Earth, in such a manner as to alter their Parts, and vary their first Powers : To which you offer'd me as Examples ; first, that 'twas possible to make Plants live in almost any Air or Soil, provided the Air it-self was not too much pent up or stagnated ; from whence I suppose that all Bodies of Earth are more or less capable of imbibing the fluent Air, and of attracting such Salts as either the Air can give, or the Earth is capable of receiving ; when these Salts (however they come into the Earth) are lodg'd in Grofs, or in a Body, the different Strainers or Vessels of the several Plants growing
C upon

upon that Spot of Earth, thus impregnated with Salts, alter those Salts or Juices according to the several Figures or Dimensions of their Strainers ; so that one Plant varies in Taste and Smell from others, tho' all draw their Nourishment from the same Stock lodg'd in the Earth. But I remember you remark'd farther, that Earths themselves being of different kinds, some sorts could not take in so many of the nourishing parts of the Air as others, and therefore the same sort of Plant could not grow in every Soil with the like Vigour ; that is, because every sort of Earth has not the same Fund of Salts, or else that every Earth is not equally capable of distributing to the Plants growing in it the Salts it contains, with the same Freedom. Again, your Instance that Thyme and other Aromatics being planted near an Abricot Tree, would destroy that Tree, helps to confirm that every Plant does not draw exactly the same share of Nourishment. *Virgil*, in his *Georgics*, gives us good Hints of the different Soils and Situations necessary for Plants of different kinds ;

*Nec verò Terræ ferre omnes omnia possunt :
 Fluminibus Salices crassisque paludibus Alni
 Nascentur : steriles saxosis Montibus Orni :
 Littora Myrtetis lætissima : denique apertos
 Bacchus amat colles : Aquilonem & frigora Taxi.
 Aspice & extremis domitum cultoribus orbem,
 Hæcque domos Arabum, piætosque Gelonos :
 Divise arboribus patriæ ———* *Georg.* 2. v. 109.

and that Earths of several kinds will imbibe certain qualities from the Air : *Mr. Boyle* assures us, that the Earth or Ore of Allum being robb'd of its Salt, will in Tract of Time recover it, by
 8 being

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being expos'd to the Air; which intimates something more than I have observ'd before, that every distinct sort of Earth has even a Power of its own, of extracting from the Air Salts of particular qualities, or else of altering the common Salts of the Air, according as its Parts are differently fram'd or order'd.

The other Remarks which I have made in this way, I shall take another Opportunity of communicating; and am,

S I R,

Yours, &c.

B. S.

And that I may omit nothing which may tend to the Pleasure and Profit of the Husbandman, or those curious Persons that admire a Country Life, I shall take Occasion to mention how far the good Management of Bees may contribute to their Master's Advantage, after giving some Account of the Economy of those wise Labourers; for I think the Profit of their Wax and Honey, tho' it is very considerable, does not carry its full Value with it, if we disregard the Virtue, Diligence, and Contrivance of the Bees, who work it for us; which we may observe with great Pleasure, by Means of the Glass or Box Hives, which are so order'd that the Honey may be taken without destroying the Bees: But whether it is for the Master's Advantage to leave them alive, when they are robb'd of their Honey, or the greatest part of it, is yet a Doubt; for 'tis a Query whether the same Bees work two Summers, or even live so long, and if not, the Food they destroy in the Winter is so much Loss: However, I have been told that a swarm of Bees accidentally fix'd a Colony in a large Wine Cask,

which had been carelessly set in the Corner of a Garden, and continued to work in it till it was quite fill'd with Honey and Wax; but I suppose the great space in the Hoghead kept them from swarming, which would be a means of their increasing greatly in number, though all the Bees of a Year old were to die.



C H A P. I.

Experiments and Observations concerning the Measure and Improvement of Land, wherein are several particular Cases stated, relating to Heath Grounds, with various Methods prescrib'd for rendring such Land beneficial.

IN the foregoing Introduction I have mention'd variety of Observations concerning Soil and Air, how much they ought to be consider'd by the Husbandman and Gardener, before they attempt any thing Material in the Practice of their several Arts. I shall now give some Examples of Lands which have been esteem'd barren, with the proper Methods of enriching them, and rendring them profitable to Mankind.

The first Example relates to Heath Ground and its Improvement, wherein is explain'd the Difference of Value in the Measure of Hills and Levels. The following Letter gives us a State of the Land when it bore nothing but Heath.

To Mr. R. BRADLEY, &c.

S I R,

I Am now about purchasing Five or Six Hundred Acres of Land in *Surry*, which the Neighbouring People tell me has born nothing but Heath in the Memory of Man; and since Mr. ——— tells me you think 'tis capable of Improvement, you will oblige me if you will give your Thoughts of it as soon as possible. I am,

Yours,

R. S.

P. S. I send you by the Bearer some Specimens of the Earths, as they lie in their Beds; N^o 1 is the Surface, 2 the next, and so on.

Account of the Earths.

“N^o I, A black sandy Soil, which for four
“Inches is mix'd with Roots of Heath;
“the same Bed of Soil (but without Roots)
“is sixteen Inches deep on the Hills, and
“in the lower Lands about two Foot: In
“this we frequently find Stones resembling
“rusty Iron.

“N^o II, or second Stratum, is white Sand,
“three Foot thick on the Hills, and is the
“same in quality and thickness in the Vale
“or low Ground.

“N^o III, or third Stratum, a Vein of Gravelly
“Soil, six Inches deep on the Hills — but
“in the Vale, a grey Sand fourteen Inches
“deep.

C 3

“N^o IV,

“ No IV, or fourth Stratum, a grey Sand, two
 “ Foot deep on the Hills, somewhat wet
 “ and springy ; but in the Vale two Foot
 “ four Inches *Marle*.

Since I receiv'd this Letter, I had an Opportunity of viewing the Land ; but as the Gentleman was not then in the Country, I sent him my Opinion in the following Epistle.

To Mr. R. S. Esq.

S I R,

I Have carefully consider'd the Ground you are about to purchase, which the Country People believe cannot be made profitable by any means : For my own Part, was I to make a Purchase of Land, I would much rather chuse it of this sort, than buy an Estate which has been already improv'd and strain'd to an high Rent ; tho' it is very certain there must be some Money laid out upon such Land as this, before it can become profitable : but that may be done by degrees ; and a Man has the Satisfaction at the same time to set an Example to his Neighbours, which may be a publick Benefit.

But before I enter upon the Nature of the Soil, and the Method of improving it, it is necessary I give you some Hints concerning the Measuring of such Lands as are Hilly or Mountainous, as many of them are in the Estate you mention ; for their valuable Contents, whether we plant, sow, or build upon them, are very different from what are found in flat or plain Ground ; and to convince you of this, I shall give you some few Examples.

Ex. I.





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Ex. I. A Hill (I suppose) may contain four equal Sides, which meet in a Point at the Top; but the Contents of those Four Sides can produce no more, either of Grain or Trees, than the plain Ground upon which the Hill stands, or has its Base; and yet by the Measure of the Sides, we find twice the Number of Acres, Roods, and Poles, which measures in the Base or Ground Plat.

Fig. I., is an equilateral Triangle, or a Body of three equal Sides: From A to B is One Hundred Yards; from A to C, One Hundred Yards; and from C to B, One Hundred Yards; so that from B by A to C, measures twice as much as from C to B, and therefore it is commonly supposed will produce double the quantity of Grain more than the Line C B: But as long as all Plants preserve their upright Method of Growth, we may be assured such Hilly Ground can bear no more Plants in Number than the Plan at the Base, as we may see in *Fig. II.*, which represents a Hill with a Row of Trees planted the Length of the Base, at certain Distances from A to C. In the same Figure we may observe the same Number of Trees planted from A by B to C, altho' the Line over the Hill measures almost double the Line from A to C.

Fig. III., gives an Example of Buildings upon a Hill; shewing, that the two Sides of the Hill will only bear the same Number of Houses that may stand in the Line at the Base.

Fig. IV., is an Example of Rails, or Park-paling, over a Hill; whereby we may discover that tho' the Measure be near double by the Way over the Hill to the Line at the Bottom, yet the same Number of Pales, of the same Breadth, and at the same Distance, serves to inclose both.

I could yet give many more Examples to prove that Hills, tho' they measure twice as much as the plain Ground they stand upon, yet the Produce of one can be no more than the other; and therefore in the purchasing of Land the Hills ought not to be sold or lett for more than Half their superficial Measure, *i. e.* two Acres upon the Side of the Hills, to pay as much as one Acre upon the Plain, provided the Soil of both is equally rich, as it seems in this Case; tho' generally the hilly Ground is thought to be more inclining to Barrenness than the lower Grounds.

But it remains that I say something concerning the perpendicular Growth of the Stems of Trees, and other Plants, as it is necessary to clear some Doubts which may arise from the foregoing Observations, among those especially who are not very well acquainted with the manner of vegetative Growth.

The Point of the Stem, or Leader of every Trunk of a Tree, seeks the Air; and therefore in Woods where the Trees are thick set, the whole Expence of Sap follows that upright Will of Nature, and the Trees in such a Station grow much taller and upright, than where one single Tree can have the Benefit of making collateral Branches.

It is necessary that every Tree should grow upright or perpendicular to the Horizon, for the more easy Support of it self; for were Trees to incline naturally more to one Point than another, the Winds would more readily over-set them; or where Trees were fully furnish'd in the Crown or Head with collateral Branches, their Weight would contribute by degrees to draw the Roots on one Side out of the Ground; but

but especially when such Branches are loaded with Fruit, we frequently find the Necessity of propping them, as may be observ'd in many Orchards. We may indeed remark, that almost every Stem and every Root is first form'd in a bending manner under Ground, and yet all these Stems become strait and upright when they get above Ground, and meet the Air ; and most Roots when they gather Strength, run as directly downward, and shun the Air as much as possible.

As Proofs of this Intent in Nature, for the upright Growth of Plants, we may observe that some (which make their first Shoots horizontally from a Wall, or the Side of a sharp Bank) turn up their Points or extreme Branches to the Air, as soon as they have taken fast Hold with their Roots. The Marricaria, Parietaria, and Antirrhinum, are so many Examples. At first indeed, when their Stems are tender, their own Weight bends them towards the Earth ; but in time, as they become stronger, altho' the Weight of the Heads of those Plants is then much greater, they turn their Shoots upwards, and at length grow upright almost parallel with the Wall.

We may further remark how much this Intent of Nature is evidenced in the Growth of Pease, Cucumbers, and such like Plants ; as soon as they meet the Air they grow erect, till they attain the height of six or eight Inches ; and then wanting Strength to support their upright Intentions, recline, and by gentle degrees reach the Ground : But Nature in this Case gives them Means of Support, and to continue their perpendicular Vegetation by Claspers or Tendrils ; and if they have the Opportunity of catching hold

hold of any Tree or Pole near them, they will then proceed in the first Rules of natural Growth. But it is not worth while to give this Assistance to every Pea we set; we have Experiments enough in every Field, of their innate Design of pointing their Branches upwards, when they have rested themselves upon the Earth sufficiently to support this second Attempt.

The Cucumber I find brings much fairer Fruit if it has the Advantage of climbing; and this Plant is not unworthy such Help; for if it is treated in that manner, 'tis grateful enough to reward our Care with a valuable Crop.

There is yet one more Observation which I think may be necessary to support my Argument, and is what I find constant in all Trees that have suffer'd by rude Winds, or have been blown down. Monsieur *Dodart*, of the Royal Academy of Sciences at *Paris*, tells us, that one Day coming from *Mendon*, the Dauphin's Palace, thro' the Park to *Chaville*, he observ'd on the Declension of the Hill several young Pine-Trees, which had been blown down by Storms at different Places; he remark'd that tho' the Fall of those Trees were very different with Regard to the Declension of the Hill, yet the extreme Branches (which had been the Leaders of the Stems when the Trees were growing) retook their natural perpendicular Growth, and turned upwards in such a manner as to form sharp Angles, which open'd more or less, as the fallen Stems on the several Declensions of the Hill directed them to be upright: And he observes likewise, that even the collateral Branches of Trees partake so far of the first Design of the Mother-Stem, that whenever they are incommoded

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commoded in their first Design of Growth, they tend upwards. But this last Observation of Monsieur *Dodart's* I have not remark'd.

From these Remarks you may observe, That Hills in their Measure contain only as much profitable Land as the Plan or Plat of Ground they stand upon : and as a Proof of that,

All Vegetables or Plants have an erect Method of Growth.

As to the other part of your Letter, which relates to the Improvement of Heath-Land ; the Remarks I have made on the several Beds of Earth, and the Specimens you sent me of them, has given me some Thoughts, which I hope may be of Service to you in Husbandry.

In the first place it is necessary to make the proper Distinctions between the Hill and the Low Grounds ; for the Vale has not only the Advantage in Measure, which I have already mention'd above, but has also the Benefit of Shelter, by Means of the Hills about it. A noble Lord lately told me, that when the Frost had destroy'd all the forward Beans and Pease on the Plains and Hills, that in a Valley in *Suffex* they remained unhurt : But this might happen as well by means of the Sea-Air, which prevents the Ravage of Frosts, as the Hills sheltering them from cutting Winds. In *Dorsetshire*, *Devonshire*, and other Places near the Sea, I have often remark'd how much Plants were benefited by the Influence of the Vapour arising from the neighbouring Sea ; but chiefly those which were of the lower Race, which are properly call'd Herbs. In these Parts I observe, that where the Hills shelter such Herbs from the North and East Winds, those Herbs come much more forward than where they have only the Advantage of Sea-Air,

But

But we may remark moreover, that the Vallies, even in the Inland Counties, are not so much over-ruled by Frosts, as the Hills. I remember about Two Years ago, as I was travelling to *Oxford* in *December*, I found a severe Frost and Snow upon *Stoken-Church Hill*, but in the Bottom there was very little Sign of hard Weather; and about the City of *Oxford* the Ground was so open, that some People were then removing Trees: I could produce many more Instances of the like Nature, would they not take up too much room in this Place; however, you may be certain of this, that all Plants which are of the under Race, and are usually sown or planted in the Winter, are much more safe from Injury of Weather in the Vallies and Low Grounds than on the Hills.

The *Apennine* Hills, which seem to rival the *Alps* in their Height, are not indeed without their valuable Produce; even on their North Side, they bring a sort of Wheat and Rye, which the People thereabouts sow in *March*, and affords them plentiful Crops: But I suppose these kinds of Grain would not stand in the Winter in that cold Situation. However, that we may try what can be done in *England* with this Corn, I have communicated some of each sort to several curious Gentlemen in the most hilly Countries in *England* to make Trials with, but have not yet heard what Success they have had: Nevertheless, I am of Opinion, they will not be disappointed; especially, because the Farmers about this side of the *Apennines* have very little Opportunity of assisting their Ground with Dung, or indeed any other Manure, unless by mixing one Soil with another.

The

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The curious Mr. Laurence, to whom we have been oblig'd for some very instructive Pieces relating to Gardening, has put us upon the Use of untry'd Earth, to help such Lands as have been worn out. And upon the foot of his excellent Experiments in that Way, I have chosen to mix the light Soils with the stiff ones; supposing, that the sandy Soils will open the Parts of the stronger Lands, and that Clays or such as are close, and the Country Farmers call fat Land, will help to nourish and enrich the Sand, which of it self is too light to hold sufficient Moisture for the support of Vegetation; or the growth of Plants. In the Land you have chosen, you have fortunately a Bed of Marle to enrich the Sands, either on your Hills or low Grounds. But this need only be used in case you design to proceed in the common Way, to turn up your Land for Corn, or such like: For even the Ground, which is now Heath on the Hills, may be render'd advantagious, by burning and ploughing it a sufficient Depth, and adapting those Plants to it which Nature at first design'd for sandy Land. For 'tis certain, there is not in Nature any kind of Soil, which has not its proper Plant to grow in it, as appointed by the first great Author of all Things.

The Plants which I find will prosper upon Sand of this kind, (*i. e.*) the Black sort, which is your upper Stratum, are Firs, Pines and Pinasters of all sorts; but the white Sand underneath to be mixed with it, will be of good use for Ash and Hazle, which yet will thrive much better if they are sown upon the Spot, than to be transplanted. For whatever Tree is taken out of the Ground, and removed to such light

Land as yours is, must be constantly water'd to keep it alive, and the Expence will be more than it will be worth in many Years; besides, a fresh Plantation of such Trees as would be necessary for you to put into a Wood, would run away with a good Sum for Props or Stakes to support them, and after all, a seedling Nursery would be certain to keep it self, without Hazard, and in gradual Time reward your Patience with sure Profit; but a more particular Direction for the forming such a Plantation, I shall give on some other Occasion. In the mean Time, I cannot help recommending, even on the Sides of such Hills, the sowing of the smallest, or as some call 'em, the shortest dwarf Pease, which may be put in the Ground the beginning of *April*, and when they happen to lie expos'd to the South Sun, I have known 'em bring good Plenty of Fruit; but they are at present so scarce that I do not know any Seedsman that has them to dispose of in great Quantities, but *Mr. Watts at Kensington*. I rather chuse this Pea than any other, because it takes up very little Room, and yet will bring as many Pods as the larger Kinds; and besides it agrees with this light Soil, requiring much less Nourishment than the other Kinds, which run too much into *Haulm*.

When this Crop comes off, the same Ground, without Amendment, will bring excellent Turneps, much sweeter than those which grow in a heavier Land.

Liquorish is likewise a very profitable Crop in Ground of this sandy Nature; but in the lower Grounds, Hops will turn to extraordinary Advantage, if they are well manag'd, as they are about *Farnham*, where the Soil is chiefly

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ly of a black sandy Kind; but in Time I shall send you a particular Account of the Methods us'd in the Hop Grounds both in *Hampshire* and *Kent*, which are the most famous Countries in the World for the Production of that valuable Commodity.

In Ground of this Nature, you might set apart some of the Mountainous for a Warren, altho' some Men might object that the Rabbits would destroy the tender, or even the grown Crops in the lower Ground; but I am well assur'd that where those Animals can meet with such juicy and succulent Herbs, as are frequent enough in low Grounds, they will rather do the Office of Weeders, than Destroyers; their Profit will very well recompense the Loss that can be sustain'd even by their breaking into Corn Ground, as I shall endeavour to prove from some Warren Accounts, which I design to publish. In the mean while we may be assur'd, sandy Hills, which lie dry without Springs, afford us the best tasted Rabbits, free from Distempers; and an Acre of such Ground will maintain and yield us more in Number, annually, than near double the Quantity of low Ground, where Rabbits are for the most Part over-fed, gain unwholesome rank Flesh, and are subject to be destroy'd by the *Rot*: For 'tis with these Creatures as with Sheep, such as have the Opportunity of feeding in rich Pasture, and grow large and fat, are never so sweet in their Flesh as the smallest Sort, which feed upon Downs where the *Bit* is short. Some, indeed, tell us that the agreeable Flavour of the Down Mutton is owing to the wild Thyme, which those Creatures eat in great Quantity on those high Lands; but I am of Opinion this is a Mistake, for I have often offer'd

offer'd that Herb to Sheep, and they as constantly refus'd it.

I remember once, observing to a Farmer about *Salisbury* Plain, how much the Ground there might be improv'd by Tillage and Plantations, he told me very gravely, that as long as the Ground would bear Sheep, it yielded its full Value; and that the Change I would promote would be expensive and precarious; besides, says he, we have now immediate Profit either from *Wool*, *Lambs*, or full grown *Sheep*, which brings us ready Money every Day; and, as he observ'd, employ'd the Poor of several Countries thereabouts. This, without doubt, must be allowed; but it is apparent from many Instances that Part of the Land there might yet be improv'd, as I endeavour to direct; for whatever Parts were lay'd up for Corn, might yield that Crop, and yet furnish some Proven-der for the Sheep, in the Winter, to save Hay, such as Turneps, &c. and an Acre then would be equal to the Expence of as much Hay as would grow upon four Acres; but I find lately some Gentlemen about *Salisbury* have come into my Method; they have began to turn up Land for Corn, Pease, Turneps, and such like, and have disposed some Grounds for Timber and Firing, both which are much wanted about that City, but the latter especially is so scarce, that some of the Inhabitants have told me, their Wood, for Firing, was brought from Places Eight Miles distant:

If there may arise some Doubts concerning what I have said before of hilly Ground, where I have made it to yield only one half Part as much Profit, with Regard to Vegetables and Buildings, as the plain Land; let us stock the
Hill

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Hill with Rabbits, and it will answer our End, as well as the Level: They have chiefly their Abode under Ground, and, according to the Depth and Variety of Turnings they possess, may inhabit perhaps the space of three or four Surfaces, which, besides their prolifick Quality, bring suddain Profit. Indeed we must suppose, that the more Rabbits are in a Warren, so much the more Food they require; but then, as I observ'd before, we find that they only prey upon such common Weeds as one would chuse to destroy in other Cases, if they are left to their Choice; and 'tis likewise observable, that when they have hilly Ground to make their Beds or Burrows in, they rarely spoil the low Lands or Plains.

If this be allow'd, I am next to observe that the Profit arising from every Acre on the Side of the Hill, by this Means, will amount to more than it would do if Plants could grow there obliquely like the Thorns or Spines on the Body of an Hedgehog; but I think I have already prov'd that Plants must grow upright.

While I am upon this Head I shall take Notice of something extraordinary relating to a Warren, as it was contriv'd and practis'd by the late Lady *Bellasis* at *Kensington*. Her Ladyship, among many other Curiosities which were cultivated in her Gardens, and Volaries, dispos'd one Part for the breeding and feeding of Rabbits, in such a Manner, as that, by a constant Supply of nourishing Food, she might draw at any Time of the Year a sufficient Quantity to oblige her Friends, and serve her Table; but to prevent the unsavoury Taste which generally attends the Flesh of tame Rabbits, consulted as much as possible the Nature of the wild Sort, how much the open Air was beneficial to them:

for this End she wall'd in a large square Place, and pav'd it at the Bottom, but in some Parts had large Heaps of Earth, ram'd hard, and turf'd, for them to burrow in; but this, which was her first Attempt, fail'd, by frequently falling in upon the Rabbits. This however gave her no Discouragement; she had a Terrace built with Arches, and fill'd with Earth, leaving proper Places for the Rabbits to go in and out; but still there were many Inconveniencies, as the falling in of the Earth, and the Males destroying the young ones, besides the Difficulty of taking them when they were wanted; but at length concluded to build distinct Cells for every Female, so order'd that they might hide themselves at Pleasure, or take the Liberty of the enclos'd Ground when they thought fit; by this Contrivance the Rabbits thrive and encreas'd, and were so much admir'd, that I shall take Occasion to publish a large Account of it.

I am, Sir,

Yours, &c.

R. B.

C H A P.

C H A P. II.

An Account of a Farm of four hundred Acres, part of which is suppos'd to be worn-out Ground, and the other Part reckon'd unprofitable Heath Ground: With the Method of improving the Whole.

To Mr. BRADLEY.

S I R,

I Have been three Times at different Seasons at the Farm, which I told you I had an Eye upon, for the Place of my Retirement; and shall give you as short an Account of the Nature of the Soil, as I can.

I find I shall have Acres enough; there being no less than four hundred; besides the Orchard, Stable-yards, and the Ground which the House, Barns, &c. stand upon. Most of it is in a miserable poor Condition; having been neglected, either from the Poverty or bad Husbandry of the late Tenant: So it will require not only a great deal of Money to be lay'd out, but the Advice of the most skilful Husbandman to bring it into Order.

It borders upon a large Heath, something like that between *Wimbleton* and *Putney*; above an hundred Acres of which belong to this Farm, and may all be inclos'd. I don't hear that the Tenant ever made 15 *l. per Annum* of these hundred Acres.

The rest of the Farm has been inclos'd, and from the Age of the Trees upon the Hedge

Rows, and some that stand round the old Orchard ; it appears to have been done above forty Years ago ; many of the Hedges and Fences are broke down, and the Trees destroy'd, excepting some Fields near the House ; the rest have been plow'd from Year to Year, while they could produce any thing. I believe it has formerly been all black Heath, such as is mention'd above, excepting about twenty Acres, which lie low upon the Side of a little running Brook ; upon which there was a pretty good Crop of Grass this present Year. There are about sixty Acres near the House, which have been kept in pretty good Order, and both the Grass and Corn upon them, are as good as any in the Country about. The Soil is generally Clay, and the Mold, where Justice has been done it, is black. I was present when one of the Fields was plow'd last Winter ; I observ'd it rise in gross Clods ; but the Frost made it fall into fine Mold when it was dress'd ; and I believe it may be brought to produce any Thing, which can be expected from strong black Soils. On one Side of the House, I find some Fields, where the Soil for three Foot down is Gravel, like that about *London* ; upon one of which, there is very good Wheat, the rest of them are in a very poor Condition.

They shew'd me two small Inclosures, which the Tenant had made (upon his first coming to the Farm, about ten Years ago) from the black Heath, which had never been plow'd before. The Method he took, was to put a great deal of Lime upon it ; after which, he had seven Crops of Corn ; the first four or five, of which, were pretty good ; but very bad for the last two Years. They have not been plow'd these
three

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three Years, and as yet, there is little Grass upon them, except upon the Tops of the Ridges, which being rais'd very high, nothing but bare Clay appears upon the Sides; all the Earth which had tasted of the Lime, being now shov'd up to the Top. I made a Man dig down three Foot, and I found it strong blue Clay, with some small Veins of Yellow running through it; which last, is not so strong as the Blue, and has mix'd with it some small Stones; and when I rub'd this upon my Hand, I found it mix'd with Sand or stony Gravel. There is likewise a Moisture in this Yellow, which I observ'd run over the Clods after it was dug up, and made them appear like Yellow Sand without, tho' within they were Blue. Possibly to this Mixture of Sand or Gravel, is owing the Mold's falling so fine when it is right dress'd. I made him likewise dig down in the open Heath, and found it of the same Nature and Colours, after he got below the Roots of the Heath. But what gave me the greatest Encouragement, was, that by digging in one of the least Fields near the House, which is at present cover'd with very fine Corn, I found the Soil the same as this; after we got deeper than the Plow or Dung had gone; which makes me hope, that by good Management, it may all be made equally fertile. I must likewise tell you, that where the Hedges have not been destroy'd, there are very clean, good like Oaks and Elms, short of none of their Age in the Neighbourhood. Having given you this Account of the Farm, and the Nature of its Soil, I must beg your Opinion, how far you think it capable of Improvement, and your Advice in the Method I shall take in managing of it. It is very proba-

ble, that from my Ignorance, I may have omitted several Particulars, which may be necessary for you to be inform'd of; and that I have not express'd my self in the proper Terms of Husbandry; but I hope you will let me know if there is any Thing you desire to have farther explain'd. I shall be at too great a Distance from *London* to have Supplies of Dung from thence, so I must content my self with what can be had upon the Farm. I can have Lime pretty cheap. Neither my Corn, Milk, nor Hay, &c. can be brought to the *London* Markets.

To Mr. BRADLEY.

S I R,

FROM Farmers we may collect the common Practice in Husbandry of their respective Countries; but it is from Gentlemen, who have given their Time and Thoughts to Improvements, that we can hope for the most useful Advices, founded upon the Experiments they have made, from their Reason and Knowledge of Natural Philosophy.

My Letter of Yesterday's Date was not gone half an Hour, when a Gentleman who has an Estate in *Dorsetshire*, and who has amus'd himself for some Years in the Way I propose to do, came in to me. I presently acquainted him with my Design, and our Discourse run entirely upon Husbandry, till late in the Evening; he having been so kind as to stay and dine with me.

I shall only trouble you with the Opinion he gave me for the managing one of the Fields, which is most worn out. In the first place he advis'd the plowing of it, as soon as there shall fall

fall Rain enough to soften it, the Ground being now too hard for any such thing's being attempted; and in this first plowing he advises the throwing down the Earth from the top of the Ridges into the Furrows. As we have generally Rains in *September*, he proposes to plow it a second time, when the first dry Weather shall come after the Rains; and at this second plowing he desires that they may go deeper than he supposes ever the late Tenant has gone; so that two or three Inches of fresh Ground may be thrown up, upon which he is for throwing a little Lime, which he says will, with the help of the Frost in Winter, make it fall down fine; and in case I cannot easily go deep enough with one Plough, because of the stiffness of the Clay, he recommends the having two, the one to follow the other in the same Furrow: This will be the more necessary, because of his desiring this plowing may be cross the Ridges; but Men must be set to work presently, to make Drains to carry off the Water, and particular Care must be taken to keep Water from standing upon such Land in the Winter. When the Weather is dry in *February* or *March*, he desires it may be plow'd a third time, the common Way the Ridges run, but still to throw it down, in order to the bringing of it more to a Level. Presently after this plowing, he proposes to endeavour to make it fine by harrowing and employing of Men with proper Tools to break the Clods: This being done, he is for plowing of it presently again, if possible, before any Rain comes, otherwise it will rise in larger Clods than ever. This fourth Plowing likewise cross the Ridges, and deep as the second, that it may be open to the Sun all Summer. In the pro-

per Season he is for plowing of it the fifth time, and sowing of it with Wheat, having first dung'd it well.

He gave me Directions for preparing of the Dung, of which I shall acquaint you before I finish this Letter.

By this Method, he says, I shall have a Depth of Mould equally good; but I must not plow to the bottom of the good Mould, when I come to sow, whereby the Seed which falls into the Furrow, will have good Earth below it for Nourishment; whereas the common Farmers, by neglecting this, lose a great part of it, by its falling upon the cold barren Clay in the bottom of their Furrows. He gives me Encouragement to expect a great Crop of Wheat by this Method, even from what is now the poorest. When the Wheat is cut down, he advises the plowing of it, and letting it lie all Winter; and in the Spring to sow it with Barley and Rye Grass, which is call'd with them Everlasting Grass. In order to prepare it for the Barley and Grass, he advises the plowing of it twice; first very deep, after which, to break the Clods, harrow it till very fine, then plow it a second time, laying it as flat as you can; sow it first with the Barley, and with the Grass, before the last harrowing is finish'd. He acknowledges that this will put me to a great Expence, but assures me that the Crops of Wheat and Barley, and the vast Crops of Grass, which I may expect for a great many Years, without being at more Expence, will fully answer my Trouble.

He gave me the following Directions for making a large Dunghill in or near the Field.

To chuse a plain Spot of Ground, and there to dig a Pit sloping down to the middle, then
to

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to throw in Horſe or Cow-dung about two Foot ; then to throw upon it the Earth dug up, about two Foot thick, upon which he deſires me to put ſome Lime ; after which, Dung again, and Earth upon that, with Lime as before. The Earth from the clearing of the Ditches, the Road, or the Rubbiſh from the repairing of the Houſe, he tells me are all good Mixtures. Thus I may repeat the Dung, Earth, and Lime, till it is large enough for the Field for which it is deſign'd, or while I can have Dung enough, carefully to cover it with Turf, or ſome ſuch thing, from the Sun. To prevent too much Wet coming upon it from higher Grounds, which may be done by making a Furrow with a Plough round it, to divert ſuch Water coming upon it ; and likewiſe to take Care that the Moiſture don't run from the Dunghill. To make the Dunghill broad rather than too high, and to let all this Mixture lie and ferment together, till I am ready to plow the laſt time for the Wheat. If I ſhall find any Graſs riſe from the Earth, he adviſes the trenching of it next Spring, which he ſays will mix it well together, and kill the Seeds or Roots of the Graſs.

June 23.
1723.

I am, Sir,

Your moſt

humble Servant,

G. D.

Answer

*Answer to the foregoing Letters, with the
Method of improving the said Land.**To Mr. G. D.*

THE Account you have sent me of your Farm is so much to the Purpose, that I think my self almost as capable of judging of it as if I had seen it : The Description you give me of the Soils sufficiently explains to me, that they may very easily be made to enrich one another ; and as they are the principal Points upon which depends your Improvement, I shall begin with examining the Particulars, *viz.*

Heath Soil, which is light and open.

Gravel, or Gravelly Sandy Soil, open.

Yellow Clay, the least binding or heavy.

Blue Clay, the most binding.

When we have these four Soils in an Estate, it is my Opinion you cannot complain ; for in the stiff Soils there is an excellent prolifick Virtue ; they abound in the vegetable Riches, but by means of an oily, or rather a viscous quality which is in them, the Parts are so closely bound together, that they cannot act unless they are open'd ; and these strong Soils in wet Seasons ruin Corn, though they produce good Grass ; while the light Soil brings good Crops of Corn, and are not without tolerable Crops of Grass at such Seasons.

In dry Seasons Corn will come to good Perfection (tho' the Straw is short) upon lighter Land,

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Land, and Grass will be very little worth ; therefore I never prescribe Grass to be sown upon light Land, unless it be such as is commonly call'd Clover-Grass ; or if the Ground be gravelly, then we may sow St. Foin, which will bring a good Crop, especially if the Season be not too dry.

When I speak of these Soils in this manner, I suppose them always upon a plain Piece of Ground, but when there are Hills, there is a great deal of difference, for the Clay flings off the Water ; and though the sandy Hills receive Wet, or drink it up when it falls, yet it sooner exhales, and the Crops sooner drop than those upon sandy or light Earth. On the Plain the Declivity of the Hills answers the end of a Drain, and a Hill is more expos'd to the heat of the Sun, so that Hills seldom give us any rich Produce, but as I observe, are gently wash'd by the Rains into the Vallies, and thereby give them a rich Manure ; so that the Vallies bring partly from hence good Crops of every sort : I allow too, that Vallies have commonly the Advantage of being water'd upon Floods, which oftentimes happens ; and from the fine part of the Earth, which comes among the Waters, the Vallies are still better fertiliz'd, besides the Benefit the Water it self bestows upon the Earth : It is therefore no Wonder that your Ground next the River, which lies low, and it may be is sometimes overflow'd, will bring good Grass. We have an Example of that kind in the Field which lies near the *Thames*, adjoining to the Walk which leads to Lord *Ranelagh's* by *Chelsea*, even in the dryest Years.

I come next to Particulars, how one sort of Soil should be fertiliz'd and improv'd by another.

ther. Your Clay Ground, as it happens to be more or less heavy, should have more or less of your gravel or sandy Soil laid upon it; for the sharpness of the Sand or Gravel will open the parts of the Clay, and after two Plowings will render that stiff Soil mellow, and fit to receive Grain. I have seen an extraordinary Crop of Barley and Clover upon Land order'd after this manner, insomuch that the Clover has been cut three times the next Year after Sowing, and the Year it was sown, as soon almost as the Barley was off the Ground, it was of great Use to feed and fatten Cattle.

When such Ground has lain three Years, turn it up and manure it with your black Heath Soil, that is with such of that Soil as is tender, and open'd by the Roots of the Heath: and it is likewise of great Use to burn the Heath; and lay the Heath Ashes with the Heath Soil, upon your stiff Land, this will enrich the Ground extremely. For however Heath Ground is suppos'd barren, yet by Experience I find it to be of excellent Use, when 'tis mix'd with Clay, for the Production of Corn.

'Tis to be noted, that where the Soil is very stiff, it should be cover'd at least two Inches thick with the sharp Sand or gravelly Soil, but it will keep longer fertile, if it is cover'd at first four Inches thick, and especially if it be often plow'd; for every plowing breaks and opens the Clods of Earth, and mixes the sharper Soils with the Clay: and that this Plowing may still turn better to Account, and that the Soil may be kept longer in Strength, the Crops must be often chang'd.

As for Example, when we have cut Barley that has not had Clover sow'd with it, we must plow

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plow our Ground for sowing of Turnips, which must be hough'd after they have appear'd above Ground three Weeks, to stand at the Distance mention'd in my *New Improvements of Planting and Gardening*, under the Title of Turnips, and manag'd as is there directed, if there are Markets for them; or else one Houghing will serve if they are for feeding Cattle, such as Cows, Oxen or Sheep; which, if they eat them upon the Spot, will still enrich the Ground, and with their Dung, and the rotten Leaves and Scraps of the Turnips, must be plow'd in early in the Spring. And then if you find the Earth too much inclin'd to clod, lay upon it some of your Heath Soil, or sharp Sand or Gravel, either single, or both together, to be again plow'd with a Breast Plough, which is a sort of Plough much us'd in *Gloucestershire, Worcestershire*, and the Counties adjoining: and this Plough will break the Clods, and mix the stiff and mellow Soil together, so that 'twill be fit for Pease the same Spring: and in sowing of them we must observe, that if there is a Market to sell them while they are green, then they must be sown in Rills somewhat more than two Foot apart, or if they are design'd for Seed, then they may be sown like Grain, to stand about five or six Inches apart.

N. B. This Breast Plough does not open the Ground above four Inches deep.

When the Pease are off, turn up the Ground with the common Plough, and lay the Ground in Ridges for Wheat; you will then find it mellow and open, and you will have no Occasion to use either Dung, Lime, or Chalk, it will bring you such a Crop as will very well satisfy the Pains
and

and Care you have been at ; and as I have prov'd in several Places, even excels those Lays which have been fallow'd, and manur'd with Lime, Chalk, or Dung.

In this Way of dressing and managing of Land, one great part of Expence is saved. There is no Time lost, nor does the Soil lose its vegetative Quality, but if many sorts of Corn were to be sown upon it, so as to follow one another, the Ground must necessarily be worn out for Corn; but not for other Things of a contrary Nature, such as Turnips, Pease, Beans, &c. which draw from the Earth a quite different Nourishment.

And when a due Regard is had to change the Crops in the Manner beforemention'd, repeating now and then the Manures as above, the Ground will constantly improve : It may at any Time be laid down for Grass, by sowing it with Rye Grass, and Clover, after 'tis made as level as the Ground will allow, or else there is a sort of *French* Grass with a Purple Head, that is a Fortnight forwarder, to cut for Hay than any other I have seen ; the Farmers about *London* know it by the Name of *French* Grass.

And now I have said so much concerning the Produce of a Piece of Ground, order'd according to my own Directions ; it may be that the feeding of Cattle may be more profitable than Grain, but that depends chiefly on the Markets. A Lady in *Nottinghamshire* who has Pasture enough for nine Cows, employs their Milk to make Cheese, which is very like that which is so famous at *Stilton* : In one Summer she made sixty Cheeses of twenty Pound Weight each, which were so rich, that at first Hand, they
were

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were sold for sixty Pounds, which is Twelve pence per Pound: The Receipt for making *Stilton* Cheeses I shall insert in another Part of this Work.

As for the Grounds of a contrary Nature from those mention'd before, they are to be reliev'd by the stronger or stiffer Land; so that when Carriages are employ'd to bring the lighter or more easy Soil to the strong or heavy Ground, they may carry some of the strong Soil to the light Ground; but this need only be done upon such Land as you design for Corn, Grass, Pease, Turnips, and such like; for the Lands as they now are, may be render'd fit for some very useful Crops by common Plowing only, without any Manure.

Your Heath Ground newly turn'd up after two Plowings, is fit to plant Saffron upon, which will turn to very good Account; it may bring you Twelve Pounds an Acre, one Year with another, if you have Hands near you to gather it; for not only the Goodness, but the Quantity of the Saffron depends upon its being gather'd early in the Morning.

These Heath Grounds will likewise (without manuring) bring very good Potatoes, which is a Root so useful to the Poor, that I am surpriz'd any thing so valuable has yet hardly reach'd the Country. The stiffer Soils (without manuring) will bring excellent Beans, which may be sav'd for Seed to a good Profit; especially the broad *Windsor* Bean. I have seen some Grounds which have been dug for Brick Earth, that were stark Clay, and upon one Plowing were planted with this sort of Bean, that brought an extraordinary Crop.

If you have any Design of making Beds of proper Manure for your light or heavy Land;
it

may be done for the light Land in the following manner : Sink a Trench a compleat Spit deep in the Ground, and lay therein some of your Clay Soil ; then over that put a Covering of Chalk or Lime, with some Heath Mold, and repeat the same over again, till you think the Heap is enough for the Ground you design, and turn this over about *Midsummer* before you use it ; but if you design an Heap of Manure for your Clay Ground or stiff Soil, then make a Layer of your Sand or Gravel skreen'd, and upon that some of your Heath Soil, and so repeat these *Stratum super Stratum*, till you have a sufficient Quantity for your Use ; and in this Case what Rubbish you can get from the Repairs of your House, will do well to mix with it. This must be turn'd once before you use it : But when all this is done, I cannot help hinting, that the greatest part of the Farmers are in the Wrong, when they suppose that Land cannot be esteem'd fertile, unless it produces good Wheat or Grain ; and so to prepare all their Manure on purpose for such Crops, and nothing else ; or that there can be no rich Manure for Land, but what is compos'd of Dung, or Lime, or Chalk. If one can make as much or more Profit by other Plants, as one can by Wheat or other Corn, it is as reasonable to sow or propagate them, as it is to sow Wheat or other Grain ; and I am sure there is no Soil in the World which will not bring some Crops which may be as profitable as Wheat. Your Clay Ground when it is first turn'd up (tho' I do not make it an Instance of what I have just now said) will, after a little breaking the Clods, bear a rich Crop of Flax, and with a little Care in manuring this stiff Soil with the Heath Soil, and the Heath Ashes,
and

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and a little Lime, it will be render'd fit to bear good Hops; for the Management of which I would recommend to you a little Treatise call'd *The Hop Garden*, lately publish'd, and dedicated to me, by a Gentleman who dates it from *Maidstone in Kent*; it may be had at Mr. *Richardson's*, a Printer in *Salisbury-Court, Fleetstreet*; in which Work you will find the necessary Directions for treating the Hop, from the first making the Ground, to the drying the Hop for Market. And that this may answer still better with you, I would advise the making a Plantation of Alders in some of the strongest Ground upon your Estate, from whence you may expect good Poles in four Years after Planting; nor should the Willow and Black Sallow be neglected, they will produce very good Poles in four or five Years; the Hazle, the Ash, the Oak, the Chestnut, and Walnut, and especially the *Scotch Firr* should be propagated upon such Ground as yours; they will be very profitable in themselves, and ornamental to your Estate, and shelter your Under-crops.

I approve very well of what the *Dorsetshire* Gentleman told you about the often Plowing your worn-out Field; but I am assur'd, the Expence of Dung may be sav'd, since you have so many good Ingredients about you.

Having now explain'd how your several Soils may be improv'd by mixing one with the other, and by appointing to each of them the Crops which are most natural to them; we shall in the next place consider of the best Way of dividing the Land into Parcels, and of the fencing it with proper Trees and Shrubs.

The Four Hundred Acres may be dispos'd after the following manner, viz. Two Hundred

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Acres

Acres for Corn and Grass ; One Hundred Acres for Pease, Horse-Beans, Turnips, Potatoes, Kidney-Beans ; for Seed, *Windsor*, or other Beans ; for Seed, Saffron, &c. and One Hundred Acres for Wood ; and the fencing in of the Whole is one of the first Things to be consider'd.

The Plants or Shrubs for fencing, are the Alder, Hazle, Black Willow, Crab, and White Thorn ; the two last especially make incomparable Hedges where they like their Ground. There are Men who make it their Business to get these out of the Woods, but those that are rais'd in the Nurseries are much better, being better rooted and prepar'd for transplanting. Where the Crab and White Thorn will not, through the extraordinary stiffness of the Land, come to any Perfection, the Black Willow will thrive and prosper, or Alder is so well acquainted with all kinds of Soil, that it will prosper any where.

The Hazle likes a lighter Soil ; so that one or other of them will hit every sort of Ground you have upon your Estate : I may hint by the by, that the Willows of all kinds, Poplars, and Alders, delight in the wettest Places, and will grow well in any Soil which is not too dry.

The Manner of making the Banks and Ditches is known so well to the Country Workmen, that it needs no Explanation : But it is sometimes necessary for the draining of Ground to consider well how to dispose them, so that they may have a Communication with one another, to prevent any standing of Water. The Method which I propose for the planting of Hedges for Fences, may be seen in the first Part of my *New Improvements of Planting and Gardening*, where likewise may be seen the Manner of raising

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telling all the sorts of Plants which I here mention for fencing of Ground, except the Alder, which I forgot to touch upon in that Work. And indeed I would advise you to begin early with a Nursery of these and other Trees, for the Embellishment and Improvement of your Estate: For though you may think perhaps, as many Gentlemen do, that Trees are a long while before they grow to be of any Value, yet you will find, if you were to buy the young Trees and Plants, which you will have Occasion for from the Nurseries, they will amount to a considerable Sum of Money, besides the Hazard of their growing, by their being two or three Days out of the Ground, between the time of taking them up and replanting them. But, as I hinted above, I have not given any Directions for the propagating Alder, I shall here do it in few Words. We must in *October* provide a sufficient Number of Cuttings of the Shoots of the last Year, about two feet in length, and set them so deep in the Earth, that about three Buds or Knots may be bury'd in the Ground: It will be best to plant these Cuttings in the Places where you design them to stand, and you will have a good Fence in Three Years Time, by the end of which Term the dry Hedge will be decay'd.

The Trees for Timber, or which may be of Use upon your Soils, are the Oak, which will do well upon your blue Clay, and the Chestnut upon the same Soil, if it is not too springy; upon your gravelly Soil the Ash and Elm; the Walnut will prosper well upon such Clay Soil as is the least heavy; and the *Scotch* Firr will thrive extremely upon your Heath Soil, and indeed so will the Pine and Pinaster, which in Twenty

Years Time will make Trees worth about Ten Shillings *per Tree*; I have seen them not only val^ued but sold at that Price, and at the same time some of Thirty Years Growth were sold for Twenty-five Shillings *per Tree*. Particular Directions for the raising and ordering these Trees are set down in my *New Improvements*, and in another Part of this Treatise; but concerning the transplanting of Trees, and especially upon your stiff Soil, I must apprize you of a dangerous Method taken too frequently by the Gardeners, which ends in the Destruction of the Trees, perhaps in three or four Years after they are transplanted, tho' they have made a good Appearance for the two first Years, and were thought to be in a thriving State.

When the Gardeners I speak of, meet with a strong heavy Soil, which they suppose to be unfit for the Tree they design to plant, the first Thing they do, is to dig a Hole or Pit in the Ground where the Tree is to stand, and to fill up that Hole with fine prepar'd Mold, and plant their Tree therein, which for a little while will grow, but when the Rains fall, the Water lodging in those confin'd Places, grows stagnant, and chills and rots the Roots of the Tree until the end is Death; but, to avoid this, I prepare little Hills of the Mold, which is to be found upon the Surface of such Clay Ground, and when it is beat fine with the Spade, and has had Time to settle, I then plant my Trees upon the Hills in a thin Mud, which quickly settles about the Roots, and keeps the Air from them, so that none fail. If we make such Plantations in *September*, even while the Leaves are green upon the Trees; if the Trees are large, we must take Care to stake them well against the Winds,

or

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or if they are very small, that Expence may be sav'd. In this way of Planting, the young *Fibres* of the Roots are unconfin'd, and have Liberty to make their Way where they best like; but in the Holes which are dug in the Clay or cold Gravel, the Trees, if they should live till their Roots reach such Soil, yet being confin'd, as one may say, from sucking of more wholesome Food, they are poison'd, and canker till they die.

But if we raise our Trees from Seed, in order to make Woods, then I find it best to sow such as the Oak, Ash, Chesnut, and such like, with *French Furze*, which screens the young Plants from the Injuries of the Weather, and makes them shoot with clean upright Stems: An Example of this we have between *Oxford* and *Abingdon*.

When I consider farther of your Farm, I cannot omit giving you a Word or two concerning the propagating of Poultry.

In my discoursing on this Subject, I cannot better inform you of the Methods which should be taken for the Welfare of a large Stock of Poultry, than by first laying before you the Errors which some have fallen into, who had large Numbers of Fowls bought on purpose to make Advantage of them in breeding and fattening them for the *London* Markets.

It is now about two Years since some Gentlemen in Partnership provided a large Piece of Ground at *Hoxton*, enclos'd with a Wall, for the entertaining about eight hundred Fowls, besides Ducks, Turkeys, and Pheasants. There was a considerable Sum of Money laid out in building Houses for their Shelter, and for fattening them, and for the Hens laying and set-

ting; and though there was great Skill us'd in the contriving of these Necessaries for the educating, preserving, and encreasing of the Poultry, yet it seems that for want only of due Regard to the natural Constitution of these Fowls, they were attack'd by a violent Distemper, which carry'd off the greatest part of them, and by which likewise the very Eggs were render'd so imperfect, or I may say, were so poison'd, that hardly one in twenty were prolific. I consider'd this Case more particularly, because a Design of that Nature, well carry'd on, might turn to very good Account, especially where it has the Advantage of the Neighbourhood of the London Markets. What I first took Notice of as a wrong Step, and what I conceive was the prime Cause of disordering the Fowls, was the Closeness of the Houses where they were confin'd in the Night-time; for though there were Windows in the Front of Lattice-Work, yet they were so small, that they could not admit of Air sufficient to keep the House sweet, nor sustain the Life of so many Creatures together, which are naturally dispos'd to breath in a free open Air.

To have remedy'd this, in the first place I would have advis'd, that the Front and End of the House should be made of open Lattice-Work, in order to admit a greater Fund of Air, and likewise that the Floor of such a House should lie upon a Declivity, the better to wash away the Dung into some Reservoir appointed for it without the House; for this Dung is full of Salts, and a great Enricher of Ground to be strew'd thin upon it; and even the Water which carries it into the Reservoir, is of good Use to sprinkle upon Land just before a second Plowing.

By

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By thus opening the House to the Air, and keeping it sweet and clean, I am convinc'd that the Fowls would not be so inclin'd to droop, as they are when confin'd in a closer Place.

In the next Place we must consider, that when we attempt to feed such a Number of Fowls with Brewer's Grains, they should be always fresh, i. e. not more than twenty-four Hours old, for when they turn sour, they purge the Poultry with that Severity as weakens them almost beyond Recovery, as I have experienc'd:

But the last and great Error which contributed the most towards the Destruction of this Undertaking, was the wrong proportioning the Number of Cocks to the Hens, for there were not above Ten Cocks to accompany about Six Hundred Females; and the Distemper which was occasion'd by this inequality, prov'd to be no less than a Pox, which was attended by very violent Symptoms; the Cocks were so straiten'd in their too much Exercise with the Hens, that it was not uncommon to see them three or four Minutes in Company with a Hen, without at last performing the Office of Generation, and the Hens tir'd by such an uncommon Procedure, had their Parts inflam'd to a very great Degree, and soon after there issu'd from their Nostrils a purulent Matter, which after continuing several Days, ended their Lives. It is not to be wonder'd at if the Hens, in this dangerous Condition, should lay Eggs unimpregnated; or if they had the Cocks Tread in them, that they should bring such Chickens as were unhealthy, and incapable of being brought to any tolerable Perfection.

It is therefore necessary, when we design to breed Poultry, to allow one Male to seven or

eight Females, which I find by Experience to be a right Proportion; and where there are more Females to one Cock, the Eggs are uncertain in their hatching, and many are lost: As for the Objection, that many Cocks will not live together, it is only where they have not Hens enough; but where the Hens are according to the Proportion mention'd above, I have known above a dozen Cocks agree very well in one Farm-yard.

I shall conclude these Directions for the Farm with taking Notice that the Enlargement of your Stock of Water, by making a Fish-Pond or two, will turn to Account as well for the Cattle as for the Fish it will produce; and if you are dispos'd to have as many Eatables upon your own Ground as may be requir'd for the Service of your House, I believe you will find considerable Advantage from such a Warren as I have before directed.

I am, Sir,

Your most

humble Servant,

R. Bradley.

CHAP.

C H A P. III.

The manner of stocking a Farm of two hundred lib. per Ann. with Timber, Poultry, and Cattle, in several Letters from Mr. W. Waller; with a particular Account of the Profits arising by Cows, either in Milk, Butter, or Cheese.

To Mr. R. BRADLEY, &c.

S I R,

April 4 1721.

I Have been now seated about two Years and Half in the West of *England*, where I find more Satisfaction in one Day, than *London* could produce in a Month. I am Possessor of as much Land as might be let to Farm for Two Hundred Pounds *per Annum*; and from the Employment I have in it, I enjoy perfect Health, a plentiful Competency, and the desir'd Sum of every Thing, CONTENT. My Business affords me wholesome Exercise, which makes me Amends for the Time I lost in the Diversions of the Town. My Plenty proceeds partly from the Cheapness of the Country where I live, and partly from a little Art, which I practise, of keeping within my own Jurisdiction those useful Things which will constantly supply my Friend with a good Dinner, though the Markets were vacant; from such Fountains, you may easily guess the Enjoyments which are continually flowing for my Advantage and Satisfaction.

I am

I am persuaded since you are upon such a Work as *A General Treatise of Husbandry*, some Particulars of my Management, and the Account of the Profits I gain from my Labours, will not be disagreeable to you; and may perhaps contribute to cultivate in the Minds of your Readers the useful Art of improving the Land-ed Estates.

The first Thing I did when I came down to this Place, was to examine my Stock of Timber, and agreeably to your Directions, to weed out such Trees as were not capable of improving themselves, either because they were past the Time of their Growth, or had been long kept as Pollards, or hurt in their younger Days: From these I got a good Stock of Firewood, some very useful Timber towards the Repair of my House, and a great Quantity of Paling, which served to enclose a Piece of Ground of fourteen Acres; and as much more, of all sorts, as was sold for almost thirty Pounds; which Sum did not only pay my Expences of cutting down my Wood, and bringing it to the Uses mentioned, but left me, in ready Money, upwards of fourteen Pounds, which I apply'd to the Improvement of the Estate in the following Manner.

| | <i>l.</i> | <i>s.</i> | <i>d.</i> |
|---|-----------|-----------|-----------|
| I bought a hundred Young Elms, which had not been trim'd in the Nursery; their Height about eight Foot, for _____ | 3 | 00 | 00 |
| Paid for Carriage from the Nursery to my Ground _____ | 9 | 01 | 00 |
| Paid for digging the Holes, planting and staking them _____ | 0 | 03 | 00 |

Paid

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| | <i>l.</i> | <i>s.</i> | <i>d.</i> |
|--|-----------|-----------|-----------|
| Paid for trimming two hundred Stakes, from the Lop of those Trees I cut down _____ | 0 | 01 | 04 |
| Paid for two Bushels of large Acorns _____ | 0 | 05 | 00 |
| Paid for digging twenty Rod of Ground, at 3 <i>d.</i> per Rod, and sowing them _____ | 0 | 05 | 00 |
| Paid for one Bushel of Beech Mast _____ | 0 | 02 | 06 |
| Paid for two Bushel of Ash Keys | 0 | 04 | 00 |
| Paid for three Bushel of Quickset Berries _____ | 0 | 06 | 00 |
| Paid for digging twenty Rod of Ground, at 3 <i>d.</i> per Rod, and sowing them _____ | 0 | 05 | 00 |
| Paid for two Bushel of Spanish Hazle Nuts _____ | 0 | 10 | 00 |
| For Carriage _____ | 0 | 02 | 08 |
| For digging ten Rod of Ground, and sowing them, at 3 <i>d.</i> per Rod _____ | 0 | 02 | 06 |
| For six Hundred Chesnuts, at 6 <i>d.</i> per Hundred _____ | 0 | 03 | 00 |
| For six Hundred Wallnuts, at 6 <i>d.</i> per Hundred _____ | 0 | 03 | 00 |
| For two Ounces of Scots Firr Seed | 0 | 10 | 00 |
| For digging twelve Rod of Ground, and sowing them, at 3 <i>d.</i> per Rod _____ | 0 | 03 | 00 |
| For two thousand Elm Sets, at 2 s. 6 <i>d.</i> per Thousand _____ | 0 | 05 | 00 |
| For preparing the Ground, and planting them _____ | 0 | 01 | 08 |
| I allow for the two Years Rent of the Ground thus employ'd _____ | 0 | 10 | 00 |

The

The Ground was already enclosed; so that I shall not guess at the Price

The whole Amount of this Timber and Wood Plantation is } 7 03 08

The Ground being thus disposed, I must confess I was a little impatient to see how my Nursery would improve.

When I planted my hundred Elms, viz. at the End of *August*, agreeably to an Experiment you try'd at my Brothers, I gave them at least a Barrel of Water to each Tree; so that the Earth they were planted in, was almost like Pap, or a thick Mud, which I remember the late Duke of *Rutland* told me you had advised him to do, in order to settle the Earth close about the Roots of Trees, and to keep the Air from drying the Roots; and which, I find since in a Letter from you, has been practis'd by Mr. *Johnstone*, at *Twittenham*, some Years; but his Method, by what you observe of planting Trees directly in Mud, I conceive to be much better than what I learned from you, at first, because by what you relate, I understand that Gentleman makes every Part of the Summer Season subservient to his Art. Pray give me some Account, if possible, in your next, what Success that curious Gentleman has had in his Plantations of this Sort. — My *August* Plantation from your Experiment, I find to do very well; but I did not trim my Trees till the following Spring, which I think has given them more Strength of Shoot, than my Brother's, which were lopped before planting.

My

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My Acorns came up in six or eight Weeks after planting; so that the first Year I had several thousand young Oaks about four Inches high, which, according to the Rate of the Nursery Men, were worth then at least 2 s. per Hundred; but to test their Value very moderately to you, who must allow for Chance in Badness of Seed, and Accidents by Vermin, I will only suppose Four Thousand, which may be about Two Thirds of my Number, and then the Value will, in the six Months Growth of young Oaks from the time of sowing, be 4 l. and the second Year (if there happens to be a Market for them) about three Shillings per Hundred, which is six Pound.

The *Beech Mast*, the *Ashen Keys*, and the *Quickset*, appeared above Ground the second Year; some of the Ashen Keys, indeed, being old Seeds, as you have observed, came up the first Year; but I have now a large Number of each, which make a good Appearance, and will serve to plant a large Piece of Ground, which I am about to purchase: To reckon only 10 s. per Thousand for my Beech and Ash Plants, I have enough to bring me 3 l. 10 s. and my Quickset, which is excellent to plant for Fences, amounts to about Nine Thousand Plants, for which I am offer'd 10 s. per Thousand at *Michaelmas* next, so that their amount will then be 4 l. 10 s. which with the 3 l. 10 s. Value of the Beech and Ash, is 8 l.

Of the *Hazle*, I have hardly Two Thousand Plants, which, according to the Rates given for the Slips and Sets of them, in the Gardens about *London*, may very well be worth to me or my Neighbours, 2 s. per Hundred, with less Uncertainty in transplanting, and less Expence of Carriage; so that their Value is about 2 l.

Of

Of the Chestnuts and Walnuts, one with the other, I have not above Seven Hundred Plants, but they are prosperous; and, I think, may at a moderate Price be valued at 2 s. 6 d. *per* Hundred, which makes 17 s. 6 d.

My Scots Firr Seed came up the first Year, so that I expect they will be near two Foot high this Summer, and then at a moderate Price, as I am told by the Gardeners about me, will be worth 15 s. *per* Hundred. From the two Ounces of Seed, I have about Eight Hundred, from whence I suppose above half the Seed was lost, either in the Ground, or devour'd by the Birds, who are very voracious of them; but to defend my Seminaries for the future from the Birds and the Snails, which are very fond of them, while they are in their tender Shoot, I have contriv'd a Frame to enclose each Bed, of Planks pitch'd over, and thickly covered with Glasse, beaten moderately small, so that no Snail or Slug can crawl over them, to get at the young Plants; and Part of an old Net strained over this Frame, keeps the Birds from doing any Damage. My Nursery of Firrs, according to my reckoning, comes to 6 l.

Out of the Two Thousand Elm Sets, I have only come to good, about One Thousand, which are now worth 5 s. *per* Hundred at a moderate Price; so they amount to 2 l. 10 s.

Allowing my Calculation to be right, the Account stands thus.

Oaks

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| | <i>l.</i> | <i>s.</i> | <i>d.</i> |
|---|-----------|-----------|-----------|
| Oaks Four Thousand, at 3 <i>d.</i> per Hundred | 6 | 00 | 00 |
| Beech and Ash Plants Seven Thousand at 10 <i>s.</i> per Thousand | 3 | 10 | 00 |
| Quickset Plants Nine Thousand, at 10 <i>s.</i> per Thousand | 4 | 10 | 00 |
| Hazle Plants Two Thousand, at 2 <i>s.</i> per Hundred | 2 | 00 | 00 |
| Chestnuts and Walnut Plants Seven Hundred, at 2 <i>s.</i> 6 <i>d.</i> per Hundred | 0 | 17 | 06 |
| Scots Firrs Eight Hundred, at 15 <i>s.</i> per Hundred | 6 | 00 | 00 |
| Elm Plants One Thousand, at 5 <i>s.</i> per Hundred | 2 | 10 | 00 |

Value of my Nursery and Seminary, in its third Year, without reckoning the Hundred large Elms } 25 07 06

Expence of raising the above Plants, as by the former Account } 7 03 08

For Care of them in Watering &c. } 0 10 00

Whole Expence of this Nursery 7 13 08

Clear Profit in Nursery 17 13 10

But it remains that I give you an Account of the remaining Part of the Money I gain'd by the weeding my Woods, and how I have employ'd it to the Advantage of my Estate; the Sum in ready Money was 14 *l.* of which something more than

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than 7 l. was expended in the Nursery, so that there remain'd near 7 l. for other Improvements ; but as they are of a different Nature from those I have mentioned above, I shall rather chuse to send them some other Time. In the mean while, I should be glad to have your Opinion of a new Plough, which I hear is lately brought from *Italy*, by some *Italians*, who are said to be the Inventers of it. I am told it may be seen near *Buckingham House*.

I am, S I R,

Yours, &c.

W. WALLER.

We may observe in this Letter a true Spirit for Improvement, which it is to be wish'd may encourage other Gentlemen to encrease their Plantations : For considering the State of Timber at this Day with us, how little good there is remaining, and how few have yet regarded the Necessity of making new Plantations, I think the Publick is oblig'd to such Gentlemen as set them such useful Examples, especially when they are render'd so easy, and of so little Expence, as Mr. *Waller* has mention'd in his Account.

Fifteen Days after the foregoing Letter, I received a second from the same curious Gentleman, Part of which, as far as it relates to Husbandry, I shall insert for my Reader's Instruction.

In my last I promised you some further Account of the Method I took to set my little Estate in order, and first I shall mention the living Creatures I bought in for store.

I bought

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l. s. d.

I bought two Dozen of *Cbickens* of the Kind which has white Feathers and Legs, and which I had heard say carry'd Flefh of a much finer Grain, than the larger Sorts, with other colour'd Legs and Feathers. Those cost me four Pence a Piece one with another, and were about the Bignefs of those which one may buy of the Farmers about *London*, for six Pence a piece unfed, ————

0 08 00

Of *Geese* I bought ten Couples, a little before Harveft, for one Shilling a piece ————

1 00 00

About the same Time I likewise purchafed twenty *Turkeys*, which cost me about one Shilling each; having paid for them in Stock Wood, amounting to one Pound, as it was valued ————

1 00 00

I bought two Dozen of tame *Ducks*, at their *Midsummer* Growth, for fix Pence each ————

0 12 00

Six Pair of *Pidgeons* of the same kind with those sold by the famous Pidgeon Merchant at *Turnbam-Green*, near *Brentford*; they are of a large Sort, and as I was told, first brought to *England* from *Italy*; these cost 2 s. a Pair ————

0 12 00

I chose them, rather than to stock my Dove-Court with the common wild blew Pidgeons, because we may draw young Ones from these tame Pidgeons, almost at every Season of the

F

Year

Year, and one of these has more Flesh than three of the blew Sort; and besides, the wild common Pidgeons breed but a small Part of the Year, and even they must be, for the most Part, fed at home, if we expect any Advantage from them; so that to compare the Expence, and Profit of one with the other, I conclude there are more Advantages arise by keeping the large tame Pidgeons, than the wild Ones. Thus it appears that the prime Cost of the Poultry I bought in, amounted to 3 *l.* 12 *s.* and the Offall of my Farm Yard kept them all in good Plight, (except the Pidgeons) till we had occasion to feed some for killing; and then the Pollard which we fatten'd them with, as it was the Produce of my own Ground, did not stand me in 3 *d.* each Fowl; so that to say the most, a good fat Chicken, which would cost at the Poulterers in *London*, about 2 *s.* I could eat at home for about 8 *d.* Charge.

The early raised Pullets gave me as many Eggs in the Winter, as I used in my Family, and brought me as many Chickens as almost trebled my Number; so that I was either to chuse whether I would sell some, or allow them more Food than the Barn Door, or the Waste of the Farm would afford them; but as I had Corn by me, at little more than half the Price I must pay for it at Market, I rather chose to give them now and then a little extraordinary Food than part with them, or suffer them to wander out of Bounds to seek for it.

My Ducks and Geese, who had Water enough in the Ponds near my House, got a good Share of their Food from Water-weeds and Insects they found there; and by the help of an adjacent Common, with my *Stubbles*, were kept, as well

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well as my Turkeys, for some time from being over ravenous when they came Home. I had so great an Increase of all these, besides a good Quantity of Eggs, that one Third Part of them were sold in the Markets for upwards of 3 *l.* 10 *s.* which was above one Third more than the Value of the extraordinary Food required for feeding the Fowls remaining in Farm, and what one might reckon for the Attendance of the Woman that look'd after them.

But I cannot send you an Account of this Nature, without observing, that many may be led into Errors by breeding of Fowls, if they do not first consider, that every Farm which will Lett for 200 *l. per Annum*, will not maintain so many Fowls as I have mention'd; and, on the other Hand, some Farms of the same Rent will maintain as many more. To the first, suppose the Lands are Meadow or Pasture, what great Advantage can that bring for the keeping of Poultry? The Barn Door, in that Case, will be lean, and the Fowls starve, without as much Food bought in, as will eat off the Heads of the Fowls; like what I have observ'd at some private Houses, where they keep a large Number of Poultry, and having no Corn Grounds in their Hands, are forced to feed them at an Expence (which though it is but little at a time) amounts in the Year, to double what the Poultry is worth.

But where such a Farm is chiefly or wholly cultivated for Corn, many more Poultry may be kept upon it than I have in mine; and it would be well, if we could rightly proportion the Number: For else we may be Losers by keeping too few, as much as if we were to over-stock a Farm.

I esteem it the first Part of Husbandry, for a Farmer to consider the Expence of his House, and keep an exact Account of his Out-goings and his In-comings; and therefore I am more particular in my Letters to you upon this Occasion, believing you will give them to the Publick, if you approve of them; but a little more Time will give me more Experience, and that Experience may give me a greater Opportunity of obliging you.

I have at present about twenty Acres of Cow Pasture, besides Common, and the Advantage of some Turnips for Winter Food; by this Means I maintain Nine Cows, but find I might add Two more to my Number. The Cows, however, which I have at present, give me each of them about Three Gallons a Day at least, which together yields Twenty Seven Gallons *per Diem*, but sometimes give me Forty Gallons in a Day, from whence I have a large Quantity of Whey and Base Milk to assist the Feeding of Twelve Swine, Two of which are Breeders. In my choice of these, I rather prefer'd the black *Bantam* Breed, than the large sort common in *England*, though I do not believe this black sort eats less than the common large Kind, nor perhaps do they yield so much profitable Flesh for Market by one Fourth Part, as the others; however it is certain, that their Flesh is much more delicate for the Table than the common *Engl^{ish}* Breed; whether as sucking Pigs, or in Pork or Bacon. Again, I should remark, that for the better feeding of these Creatures, I have a considerable help from Brewing my own Drink, from some Offals of my Farm Yard, and the Mast of the Woods. But I shall be particular in another Letter, if you desire it, and give you
my

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my stated Account of Advantage by Milk, Cream, Butter, Cheese, Calves, Piggs, Pork and Bacon; and shew you at the same time, how to judge of the Expence in keeping these Creatures upon a Farm, order'd as mine is. To which I can add, if you are not already appriz'd of it, the Method of feeding and curing Bacon, as the Farmers practise in *Hampshire*, which County exceeds most, if not all others in *England*, for Flesh of that Kind.

'Tis to be observ'd, that in feeding Cows we must not let them range in too large a Piece of Ground at one Time; I have therefore divided my Twenty Acres into Three Parcels, which I turn my Cows into from one to another, as I see Occasion; commonly I allow them Eight or Ten Days in one, before I change them to another, for else they would trample down and spoil a Third Part as much Grass as they eat. By this changing of Place, and the Liberty I have of some Common and Waste Ground, they have an hearty Feed and pay me well for it: For if we were to enquire no farther than the common Expence of Feeding these Cows by the Week, which to hire Land would be 1 s. 6 d. *per* Week for each, the Charge of Feeding my Nine Cows will be 13 s. 6 d. each Week; and the Calves pay the Interest of the Money I first laid out in their Purchase, and in great Part make amends for the Time lost in the Cows growing dry. Now allowing that I have from these Cows only Twenty Seven Gallons of Milk in a Day, which is a mean Quantity, (for some Cows will yield singly upwards of Three Gallons at a Meal;) then the Value of my Milk, was it to be sold for 1 d. *per* Quart, would amount in a Day to the Sum of 9 s. and in Seven Days, or one Week,

Week, to 3 *l.* 3 *s.* from which Sum, if we take out the 13 *s.* 6 *d.* for their Week's Grazing, there will remain, neat Money, 2 *l.* 9 *s.* 6 *d.* without farther Trouble than bare Milking: But the managing this Milk in the Dairy, makes it worth more than double the Sum, as I can prove by my Farming Accounts. However at present only take a View of the plain Profit of Milk from Nine Cows, at the aforesaid Rate, for One Year, and you may partly guess at the Advantage you may reap from them: Supposing the Food of a single Cow, throughout the whole Year, comes to 1 *s.* 6 *d.* *per Week*, and that one Day with another, for Twelve Months, a Cow will give Six Quarts *per Meal*, *i. e.* Three Gallons *per Diem*, as I have before related; then we find the Milk of Nine Cows to be worth 164 *l.* 5 *s.* *per Annum*; but taking from that Sum, the Charge of feeding the said Number of Cows for that Time, which comes to 35 *l.* 2 *s.* there remains clear Profit, 129 *l.* 3 *s.* *per Annum*: And if we deduct from thence the Price of the Nine Cows, which was about 50 *l.* there yet remains the Advantage of 79 *l.* 3 *s.* which is very good Interest for Interest for Money laid out in Cattle, and their Year's Food paid for. But when I come to mention all the Advantages I make of them, you will find my Profits more than Double what I have related.

I have seen some of the *China* Geese, which I find answer your Character of them, *viz.* That they are larger than the common sort in *England*, and breed earlier; but I find the Young ones are very tender, and are both difficult to hatch and to breed up; therefore I content my self with our common Kind, which seldom bring me at a Setting fewer than Ten, Eleven, or a Dozen apiece.

apiece. I am not yet fallen into the way of pulling their Feathers, as they do every Year in *Lincolnshire*, and other Fenny Countries.

In the breeding of Turkeys I have found some difficulty, till I took the Advice of the Woman who looks after my Poultry, who by keeping the young Ones with the Hen in a Barn or Out-House, till they are about Six Week old, preserves them in good Health and thriving Condition. She tells me, that it is not only necessary to keep them warm for that Time, but likewise to keep them from eating small Snails and Slugs, which they would find abroad, and would scower them to Death. After Six Weeks she brings them out with the Hen, and places them where the Sun is moderately warm, so enclosed in an open Case of Wicker, as to prevent their ranging, and feeds them as she did from the Beginning, with Curds, in which is a little Rhew cut small, and some Ant Eggs, but puts them again into the House as soon as they have enjoy'd the warm Air for two Hours; allowing them, from time to time, as they grow more hardy, so much more time abroad, till at length they became capable of Shifting for themselves. But I must not omit to tell you, that soon after they are hatch'd, they should have a fresh Turf of short Grass every Day, but without Snails or Slugs upon it, for the Reason before mention'd.

The Reason of this Letter to you, is chiefly to put you in Mind that Husbandry does not only depend upon the Methods of Cultivating Land for Corn and Hay; for that is the least part of a Farmer's Business.

I am, Sir,

Your humble Servant,

W. Waller.

Upon my publishing this Letter of Mr. *Waller's*, concerning Profits by Cows, I receiv'd the following, which with Mr. *Waller's* Answer to it, I think, will teach us as much as is necessary for our Information in that Branch of Husbandry.

To Mr. BRADLEY.

S I R,

“ **I** N Mr. *Waller's* Letter to you, *April 19. 1721*,
 “ there is an Account concerning the Profit
 “ made by Cows, reckoning Milk at a Penny
 “ *per Quart*; it may not be amiss for you, at
 “ your Leisure, to beg the Favour of that Gentleman to examine his Account, and to state
 “ it according to the quantity of Milk to be
 “ produced next Year, and of the Money that
 “ a Farmer can make thereof in Butter or Cheese,
 “ for there are not Buyers of Milk in the Country at a Penny *per Quart*. The Hay or other
 “ Fodder to be eaten by the Cows in the Winter, is not noted in Mr. *Waller's* Account.
 “ He reckons three Gallons of Milk *per Diem*
 “ from each Cow, without allowing for the Time
 “ wherein they fail of giving so much, or for
 “ the Time wherein they go dry. Sir *William Petty* reckons for Ninety Days a Cow may
 “ yield Three Gallons of Milk; and for Ninety
 “ more One Gallon; and for Ninety more
 “ scarce one quarter of a Gallon; and for Ninety
 “ more she is dry. Thus in a Year a Cow
 “ may yield about Three Hundred Eighty Four
 “ Gallons of Milk.

“ The said Quantity of Milk will make Two
 “ Hundred and a Half of raw Milk Cheese, and
 “ One Hundred of Whey Butter, besides Whey
 “ for

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“for Swine ; or else Two Hundred of Butter,
“and One Hundred of Skim Milk Cheese, be-
“sides Whey, as aforesaid, for Drink to the
“People, and Food for Swine.

“By this Account the Profit of a Cow’s Milk
“in a Year may be about Five Pounds : This
“being vastly different from Mr. *Waller’s*, may
“be communicated to him.

“You may not think it foreign to your De-
“sign to peruse Sir *William Petty’s Political Ana-*
“*tomy of Ireland*, from p. 51, to p. 57. *Edit.* 1719;
“wherein you will see more Particulars relating
“to Husbandry ; but this relating to Milk you
“will find at p. 51, 52.

I am, Sir,

Your most humble Servant,

A. B.

The Copy of a Letter to Mr. BRADLEY, from Mr. Waller.

S I R,

“UPON the Receipt of your Letter, (with
“one enclos’d, sign’d *A. B.*) I find that
“my Letter to you concerning the Produce of
“Cows is not approv’d, or at least not well un-
“derstood by all ; the Gentleman who signs
“*A. B.* has certainly stated a very proper Que-
“stion, which I shall answer in this Epistle.

“Sir *William Petty’s* Calculation, from whence
“he argues, was general and uncertain : When
“he

“ he stated the Case ’twas for a whole Kingdom;
 “ and not for a private Farm, as mine is ; he
 “ means, every Cow in *Ireland*, one with ano-
 “ ther, may possibly yield so much Milk as
 “ Mr. *A. B.* relates ; but in a private Farm the
 “ Case is very different, and especially in *Eng-*
 “ *land*, where the Cows are generally of a larger
 “ Strain than those in *Ireland*. In a private
 “ Farm, well manag’d, every Cow that begins
 “ to abate in her Milk, should be sent to Mar-
 “ ket, and another bought in her room : So
 “ that in such a Farm as I speak of, there will
 “ be near a constant Quantity of Milk every
 “ Day throughout the whole Year ; and there-
 “ fore I reckon Three Gallons of Milk, Wine
 “ Measure, from one Cow in one Day, which is
 “ no extraordinary Proportion ; or if I had said
 “ four Gallons of Milk, Wine Measure, from a
 “ Cow in a Day, it would not amount to so
 “ much as is commonly expected from a Cow
 “ in a Day by the Cow-herds about *London*,
 “ from whom I learnt many Particulars in the
 “ Cow Business, which I shall, some time or o-
 “ ther, give you an Account of. In the mean
 “ time I shall keep to my Design of answering
 “ Mr. *A. B.*’s Letter, as far as my present Lei-
 “ sure will permit. Where a Farmer has rich
 “ Pasture for his Cows, and is skilful enough
 “ to keep only such as are young, changing
 “ them as they decline in Milk, for others that
 “ are deep in Milk ; where such Care is taken,
 “ I say, ’tis not difficult to prove, that our Cows
 “ will, one Day with another, yield Four Gal-
 “ lons Wine Measure, or more than Two full
 “ Gallons *Winchester* Measure ; and then a Herd
 “ of Nine Cows will yield about 13140 Gallons
 “ of Milk in a Year, which is 1460 Gallons
 “ from

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“from each Cow, reckoning by Wine Measure, or somewhat more than half that Number of Gallons, if we judge by *Winchester* Measure.

“Again, we must observe, that about *London* the Wine Quart of Milk, if it is pure, sells for Five Farthings half the Year, and the other Six Months it is sold for Three-Half-Pence *per* Quart by the Retailers, where Lands generally are from 40 to 50 s. or 3 l. *per* Acre : These Prices, I own, exceed the Prices in many Places in *England*, as I shall shew you in another Letter, but as they are now, a Cow's Milk in a Year, which is about 1460 Gallons Wine Measure, will amount to 33 l. 9 s. 2 d. which in Nine Cows comes to 301 l. 2 s. 6 d. *per Annum*.

“But the Cow-herds Price for Milk is much less, not exceeding 4 d. a Gallon for the Six Summer Months, nor 5 d. in the Winter ; and their Measure is almost double what the Retailers measure their Milk by : So that the Farmer only gets about 10 d. each Day in Milk from one Cow, according to the foregoing Calculation ; and then, in a Year, a Cow brings into the Farm 15 l. 4 s. 2 d. And Nine Cows at that Rate, 136 l. 17 s. 6 d. by taking only a Medium-Quantity of Milk from each Cow, *i. e.* about Two Gallons *Winchester* Measure *per Diem*, at little more than a Penny the great Quart ; or by the Wine Measure, not exceeding Four Gallons *per Diem*, at about a Half-penny *per* Quart, which is much the same. But be assur'd, that where the Cows in such a Dairy are regularly chang'd in the Markets when their Milk begins to fail, the Quantity of Milk is about double as much as I have
“set

“set down; which every one may easily guess,
 “that knows what Quantities of Milk every deep-
 “milch’d Cow will give at a Meal, and in this
 “Case every Cow is in full Milk. But how-
 “ever, let the Reckoning stand as it does, that
 “Nine Cows, to the Farmer, brings in a Year,
 “by Milk only, 136 *l.* 17 *s.* 6 *d.* the Food for
 “these Nine Cows should not be allow’d more
 “than 1 *s.* 6 *d.* *per* Week each Cow in the Sum-
 “mer, if we even rent the Grass at the *London*
 “Rate; or in Winter (that I may come nearer
 “Mr. *A. B.*’s Account) 2 *s.* *per* Week for each
 “Cow’s Provender is full enough. Let us see
 “then what the Amount will be for keeping
 “the Cows, and then balance the Account;
 “for in one of my former Letters to you, where
 “I mention’d Cows, I stated the Keeping of
 “one Cow the Year about, at 1 *s.* 6 *d.* *per* Week,
 “and even that Rate with us is too much.

“The Farmer’s Account for Milk from Nine
 “Cows, as I have rated the Milk, and the Feed
 “of the Cows, will stand thus:

| | <i>l.</i> | <i>s.</i> | <i>d.</i> |
|---|-----------|-----------|-----------|
| “To Six Months Grass for | | | |
| “Nine Cows, at 1 <i>s.</i> 6 <i>d.</i> each | | | |
| “Cow <i>per</i> Week, being Twenty | 17 | 11 | 00 |
| “Six Weeks | | | |
| “Expence for keeping Nine | | | |
| “Cows with <i>Straw, Hay, Tur-</i> | | | |
| “ <i>neps</i> and <i>Grains</i> , for Six Months, | 23 | 08 | 00 |
| “or Twenty Six Weeks in the | | | |
| “hard Months, at 2 <i>s.</i> <i>per</i> Week | | | |
| “Expence for Feeding | | | |
| “the Cows | 40 | 19 | 00 |

“Receiv’d

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l. s. d.

| | | | | |
|---|---|-----|----|----|
| " Receiv'd for 13140 Gal- " lons of Milk, Wine Measure, " besides other Profits, when " the Milkers have done, the " Money for Nine Cows Milk " in one Year, as before related | } | 136 | 17 | 06 |
|---|---|-----|----|----|

| | | | | |
|---|---|-----|----|----|
| " Receiv'd by Milk " Expence for Feeding " the Cows — | } | 136 | 17 | 06 |
| | | 40 | 19 | 00 |

| | | | | |
|---|---|----|----|----|
| " Total { Neat Profit by " Nine Cows in Milk " for one Year — | } | 95 | 18 | 06 |
|---|---|----|----|----|

" By this Account we may see that the Farm-
 " er may get 95 *l.* 18 *s.* 6 *d.* only by the in-
 " different Rate of Milk; and this Rate (if
 " there were no other Advantages in keeping
 " Cows) would amount to 10 *l.* 13 *s.* 2 *d.* each
 " Cow *per Annum*, which is above as much again
 " as Sir *William Petty* judges may be the Pro-
 " duce of a Cow in *Ireland*; but remember, I
 " say, he calculates for all the Cows in a Na-
 " tion, and therefore his Computation can be no
 " ways agreeable to private Farming; for where
 " shall all the Cows of a Nation be chang'd,
 " when they are low in Milk, for others that
 " are fresh or deep in Milk? The Cows of all
 " *Ireland*, which, one with another, are set, for
 " the first Ninety Days, to yield Three Gallons
 " each; the next Ninety Days scarce One Gal-
 " lon; the next Ninety Days scarce one Quar-
 " ter of a Gallon, and Ninety Days more are
 " dry, I think is a good Calculation in general
 " for *Ireland*, where the Cows are smaller than
 " ours:

“ours : But how can all these Cows be shifted
 “from one Place to another, or chang’d in this
 “dry State for Milch Kine, with the same Ad-
 “vantage I speak of in private Farms? And I
 “am perswaded that the Profits of raising Kine
 “from Calves will hardly make it up; for, in
 “general, we are sure all the Cows in *Britain*
 “can never be in the same Condition of Milk-
 “bearing at one time; for if they were, we
 “must be oblig’d to want Milk all over the
 “Nation for Ninety Days together; or, in
 “*Sir William Petty’s* Way, the Cows of a whole
 “Nation are dry near a fourth part of their
 “Time; but the Farmer who can change his
 “Cattle at his Pleasure, may be rich in Milk
 “constantly. There are Opportunities and
 “Practices of this daily, as you may learn from
 “some Herdsmen about *London*, who keep Four
 “or Five Hundred Cows apiece, and without
 “any Loss at the Year’s End, as some of them
 “have told me; for the Cows, when they are
 “Fat or in good Plight, sell well to the Butcher,
 “and the Food which gives them Quantity of
 “Milk, renders their Flesh of Value for the
 “Market.

“So far I shall at present answer Mr. *A. B.’s*
 “Letter, viz. that in a private Farm the Milk
 “of a Cow may yield moderately near 11 l.
 “*per Annum*, at little more than a Half-penny
 “*per Quart* Wine Measure.

I am, Sir,

Your most humble Servant,

W. Waller.

To

To these Accounts we may very well add the following Observations relating to Cows, their Food and Pasture ; and how far the Goodness of Milk, Butter, and Cheese, may depend either upon the kind of Cattle, the Soil where they are grazed, or the Management in the Dairy.

I observe only three sorts of Kine in *England*, which are remarkably different in their Colour, viz. the Black, the White, and the Red.

The Black sort is commonly the smallest, and it has been observ'd is the strongest for Labour. We find Cattle of this Colour chiefly in the Mountainous Countries, where they are still much smaller than when they enjoy the free Nourishment of the low rank Grounds ; but yet I have never observ'd them of so great a Stature or Bulk of Growth, when even they have had the richest Pasture, as is common in the White and Red Kinds : And it is a Remark of the old Authors, not unworthy our Observation, that the Black Kine, about Sixty Years since, were chiefly bred in *Cheshire*, *Yorkshire*, *Lancashire*, and *Darbyshire* ; which Counties chiefly supply, as I am inform'd, that large Quantity of rich Cheese, which we receive under the Name of *Cheshire* Cheese : And it is observable, that the Cows of this Black Strain yield seldom more than a Gallon of Milk at a Meal or Milking ; but to make us amends they continue Milcht, or in Milk, till within a very few Days of Calving, so that we can hardly say they are ever dry : Whereas the other sorts (which are remarkable for their Colour, as the White or the Red) will, after Calving, give large Meals of Milk, near three times as much as the former, but grow dry much sooner.

The

The White Breed of Kine (according to some Remarks of a very learned Gentleman, which I have now by me) were very frequent in *Lincolnshire* about Thirty Years ago, from whence he first brought them into *Surry* as a Curiosity; they are of different Make, and much larger than the Black Cattle, and give more Milk at a Meal, but go dry very soon: It is observ'd likewise in the same Remarks, that many of this Breed were then in *Suffolk*; and I wish he had gone so far as to have given us some Reasoning upon those Coarse Cheeses which we call *Suffolk* Cheese, and why they happen to be harder and dryer than any in *Europe*.

The Red Kind is commonly the largest of any Sort we have in *England*; and it is observ'd by some Farmers, will give more Milk at a Meal than the Cows of any other Colour: It has likewise been the Opinion of Physicians, that the Milk of the red Cow is more nourishing than that of any other Sort of Kine, as is remarkable by their prescribing it to consumptive Persons; and if I may be allow'd the Liberty of adding my own Reasons why it is so, my Opinion is, that whatever Body is luxuriant in Growth, denotes that it enjoys perfect Health, in that it draws Plenty of Nourishment from its Diet; and if an Animal, Vegetable, or whatever it be, is large and well nourish'd in its Kind, and that its Parts separately or all together are proper Diet for any Particular of the Animal Race, the more such Bodies are vigorously nourish'd, the more nourishing they will be to whatever Creature uses them in Dyet. One of my curious Correspondents observes in Animal Bodies, the Black, or such as have black Hair, are generally hot and dry in their Constitution, those which have Hair

Of a reddish Colour are fill'd with more vigorous Juices, and those which have white Hair, have a faint or weak State of Body, or declining in their Strength; the white, grey, or silver Hairs in old Persons, the golden Locks so much admired among the *Grecians*, and always a Beauty in their *Venus*, with many other Remarks of the same Kind; my Correspondent gives me as Proofs, that the Quantity of sovereign Juices may be judged of in such Animals, as are chiefly distinguishable by the Colour of their Hair. This is all I shall at present take from his Letter, for the Use of the Subject I have in Hand; the rest may afford matter of Contemplation another time. But to proceed upon my own Observations; wherever I have had an Opportunity of examining into this Part of Farming, which relates to the Dairy, I have always found the red Cows to give much more Milk than the black Sort, where the Farmers have been wise enough to keep one genuine Breed of Kine from mixing with another, as some curious Men do now in *Somersetshire*, and the adjacent Parts; where, as I am inform'd, the red Sort of Kine was first bred, and is chiefly educated at this Time for the sake of its large Size, which will yield in the Markets for the Butchers use several Pounds Sterling *per* Beast more than the natural black Cattle. The mixing of these Sorts, I suppose, has been a Means of producing the pied Kind, now pretty frequent, and of bringing the more lusty Race into a Degeneracy, as it has brought the dwarfish Strain to be of a larger Size than they were originally; and at the same time, the Qualities which were admir'd in either distinctly before the Coupling, are now so confounded one with the other, that their original Perfections

are hardly to be traced out. The famous *Cbedder* Cheeses which are so large and costly that few of them appear but in the Houses of Men of Fortune, are made in this County and the adjacent Parts, and take their Name from *Cbedder* a Town, as others do from *Ceshire*, a County. 'Tis, as I am well inform'd, the Custom in some of these *Western* Parts, for all the People of a Parish to join their Milk every Day by Turns, for the making of a Cheese, which is the Reason that they are so very large, and greatly exceeding the Weight of those Cheeses made in single Dairies: But whether it is the sort of Kine, or the Feed, or the Management of the Milk in the Dairy, which gives the Richness to the Cheese, is worthy of enquiry.

We may repeat as we go along, that the red Cows do not only give, for the generality, more Milk at a Meal than those of other Colours, but bring better Calves too, notwithstanding it has been argued on the contrary; some even affirming it was impossible that a Calf could be compleatly nourish'd in the Matrix, where the Milk was abundant in the Dam. Others again tell us, that the natural black Kine which give Milk all the Year cannot bring good Calves, because, say they, where this Milk is continued during the whole Time the Cow is pregnant, it must certainly draw away the Nourishment which is requisite to feed the Calf while it is enclosed in the Matrix.

To answer the first Difficulty, I think we need go little farther than what I have said before, *i. e.* that the red or larger sort of Cow which gives great Quantities of Milk at a Meal, becomes dry sooner after her Pregnancy than others; so that when the Calf begins to grow
in

in the Matrix, all the Juices of the Body are turn'd to its Nourishment, except such as are lost by Transpiration, or the feeding of the Hair upon the red Cows, which Hair is always said to be much stronger upon the Cows of this Colour than upon the Black.

On the other hand, though the black Cattle give less Milk at a Meal than the red Kine, yet they continue milch'd till near the Time of Calving; which in some Cases is rather to be chosen, than a Cow which gives a great Quantity at a Meal, and goes dry soon, as I shall explain hereafter. Nor can I find any Reason why the black Cattle, which are thus constantly in Milk, should not bring a well-grown Calf; for seeing how moderately they dispense their Milk at each Meal, we may reasonably infer that they give only what Nature allots them to spare from their Nourishment, and rather seems to be a necessary Discharge of Juices, than any Inconvenience either to the Cow or the Calf she is pregnant with: For in such a Case, the Calf will naturally draw to it self from the Mother, what Juices are necessary for its Support; and if it requir'd more than the Cow could conveniently furnish, the Cow must then necessarily languish, and as surely lose her Milk: So that while we find Milk in a Cow, we cannot reasonably suppose, that either the Cow or Calf wants Nourishment. These natural black Cows, if they have free Pasture or are well fed, will, as I am told by some Cow-men about *London*, yield one Time with another compleatly six Quarts of Milk *per Diem* the whole Year about. And considering the Time that the red Cows, or such as are deep milch'd are dry, the Milk of the black in one Year exceeds that of the red in

Quantity; but then if this Milk is for Dairy Use, it is fortunate to keep a deep milch'd red Cow to calve about the End of *March* or Beginning of *April*, that she may be come to her Milk just when the Spring is rising, and the Grass is full of vigorous and nourishing Spirits, which will greatly add to the Quantity of Milk she will give at a Meal. I have three or four times been Witness, that a large Cow has given in one Day, upwards of Thirty One Quarts; but such Extravagance soon declines, and the Cow is unprofitable during a good part of the Year, unless we let her Calf go along with her: But this is no way agreeable to the Rules of the skilful Farmers; they value the Milk for Dairy Use, while the Grass is long and rich, more than the Profits which would arise from a Calf at that Season. But when a Cow calves about *October* or *November*, the Calf may be brought up for Increase, the Milk then is not so fit for the Dairy, the Calf will be more harden'd against Distempers, and thrive by the nourishing Food of the following Spring, and be much more gentle and familiar than if it had at once fallen in with Plenty at its Birth. But it is now time that I say something of the Pasture and Food of Cows, how much the Goodness of their Milk may be influenced thereby.

And, First, we must suppose that the Juices of every Herb are fuller of Spirits, and more nourishing, when they are in the Vigour of their Growth, than when the Cold puts a stop to their Vegetation; for in some aromattick Herbs, when the Cold begins they lose their spicy Smell; and again, when the Warmth of the Spring begins to move their Juices, they regain their Odour; which shews that by Cold, Plants lose the Spi-
rits

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fits which by Heat they possess'd ; so that the Milk of Kine cannot be supposed to yield that Nourishment when the Cows feed on Herbs out of Growth, as it will do when Herbs are springing : And to prove that the Milk of an Animal can be influenced by Herbs simply, or by Heat or Cold, which alters them, I shall give some Instances.

First, When a Cow feeds where *Crow Garlick* happens to grow amongst the Grass, the Milk will assuredly partake of the Relish of the Garlick. I have often seen Cows feed upon it, and have as often found the Scent of Garlick in the Milk, as I have had Opportunity of using it ; which plainly demonstrates to me, that notwithstanding all the different Filtrations of the Juices through the Body of the Animal, yet it is necessary in Nature, that every part of the Body must draw some Nourishment from the Diet of an Animal, or the Food which every Creature receives into the Stomach, and that the Herbs which Cows feed upon either meliorate or hurt their Milk.

Secondly, At the Time of the Year when the Leaves fall, we find the Milk of those Cows which feed upon them is bitter to the Taste, and is very apt to turn or change ; so that we may reasonably suppose, that the falling Leaves have an Influence over their Milk. It is not uncommon to see Cows feed in this manner, nor is it more rare to find Milk influenced at that time, as I have said ; but whether it be from the Leaves in general that fall, and then tend to Maturation, or from Leaves of particular Plants, may be consider'd hereafter.

Thirdly, About *Autumn* it is customary near *London*, to feed the Cows with Turnips of a large

Kind, commonly call'd the *Cow Turnips*; and these are used in many Places with Indiscretion, by giving the Cows both the Leaves and the Roots, as they are fresh drawn from the Field: The Milk in this Case will likewise be bitter, though the Cows cannot get at fallen Leaves. But some Farmers, who are a little curious in the Feed of Cows at this time of the Year, have the Leaves cut from the Roots, and let them lie some time together, two or three Days perhaps, before the Cows eat them, and then they observe the Milk is not bitter: But then we must take notice, that the use of the Turnips at this Time, when Grass is scarce, is to keep the Cows full of Milk; for the dry Meat, or Hay alone, the Herdsmen suppose will dry the Cattle: Therefore the Turnips are used, as being Plants full of Juice, and are said by the Cow-keepers to fill the Cows with Milk, which might give us a farther Opportunity of Reasoning.

With these Turnips and some other Greens are Cows often fed in the Winter about *London*; but these Herbs alone are too full of Juice for the Health of the Cows; and therefore the other part of their Food is Hay, which is commonly of the coarsest sort, such as is made in Orchards, growing rank under Trees; or such as is made of the Grass of a second Spring: But I find by Experience that the best Hay is the best for Cows; it nourishes in the Winter, makes them strong, and keeps them in Milk, provided the Cows are turn'd in the warmer part of the Day into Grass, especially such as has had Dung spread over it about the End of *August*, before the Rains fall.

It is certain, that Cows which feed in the Spring upon high Grass abound in Milk, but
that

that which grows rank in Orchards, is commonly sower; for though the Cows will eat it either in Grass or Hay, yet their Milk is always poor and apt to change: Their Bodies are not strengthen'd with such Dyet; and though they continue to give Milk while they eat such Trash, yet it has been pretty well experienced by the Learned, that good Grass of the Spring, or Hay made of Grass in its Excellency, will give so much Strength to the Kine that feed upon it, that the Advantage of Milk will very well pay the Expence, and make the Milk better tasted; for where the Dyet is good, the Body will be strong, and in this Case will yield abundance of Milk, and especially such as is of good Use in the Dairy.

In *Somersetshire*, and some of the *Western Parts of England*, near the Place where the famous *Cbedder* Cheeses are made, the Lands are commonly flat and low, and are often so well water'd, that the Grass is very free and vigorous; the Cattle indeed are of a large Strain, and in this sort of Land it seems the Kine find large Subsistence: Their Parts and Vessels are naturally larger than the other sorts, and there they gather Nourishment enough from their Food to fill their Vessels and Parts, in such a manner as to make them surpass all those of the same Breed, which feed in the more hilly or dry Countries.

In *Lincolnshire*, and other Counties where this sort of Cattle is fed in Marshes, we find them grow to a very large Size; but we may remark, that these Marshes are rather used for Oxen than Cows: But however, where Cows have an Opportunity of such Food, and are of a large Kine in Nature, their Milk makes much

fatter Butter, than those which are fed upon short Grass; for a Proof of which we might instance *Holland*; where, according to my Observation, is found the fattest or richest Butter in *Europe*; and there the Cows feed in the Salt Marshes.

Where the *Parmesan* Cheeses are made, the Country is flat, and is floated Three or Four times in a Year. The most famous Place for these Cheeses is at a Town in the *Milaneze*, whose Name I do not now remember; here however we must observe, that the Water is not Salt which overflows the Land. The Isle of *Ely*, and other fenny Countries, always produce very good Butter; and I think it is as just an Observation, that the high dry Grounds never yield Butter, which has either Richness in it, or will keep three Days without changing to such a Relish as a nice Taste cannot bear. And again, in such Grounds we find, that the Cattle of whatever sort they are, do not produce so much Milk, as they would do if they were fed in low Grounds or marsh Lands. And here we ought to consider in particular, how far every distinct Kind of Grass, or Herb, influences the Milk, the Butter, or the Cheese; and how it happens that the Milk of a Cow, of one sort, shall differ from another, though they both have the same Pasture; or whether it is the Nature of these Animals at one time more than another, to give unprofitable Milk from the same Diet: Here would be a vast Field to reason upon; but at present I have not Materials sufficient to explain this Matter so fully as I would do. Before we can rightly undertake it, we must be satisfied what sort of Grass or Food the Cows have in *Suffolk*, what in *Gloucestershire*, and what these Creatures

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tures feed most generally upon in the other Counties of *Britain*, and also how such Grasses are water'd.

But again, if the Milk be perfectly good, it may be spoil'd by bad Management in the Dairy. In *Devonshire*, and some other Counties in the West of *England*, I observ'd that the Butter in many Places tasted of Smoak, and was apt to grow rank soon after making, which made me curious to enquire into the Cause. The Milk of it self was good, and the Cream was rich; but I found the Method of making it into Butter occasion'd both the Evils: For, first, I found that the Milk was set in brass Pans; and in the next Place, the Butter was made in brass Kettles over a Fire, without a Churn: From whence we may easily conceive, that the best Milk, with this Management, could never yield good Butter; for it is certain, that Brass will communicate part of its rank Quality to any Liquor it is infused in: And where the Liquor has the same Opportunity of corresponding with Brass, as in the present Case, for twelve Hours at a time, it is no wonder if the Milk gathers from it an ungrateful Relish; but especially when it is warm'd over the Fire in brass Vessels, for then it must certainly partake of the Qualities of the Brass more than it did before in the Dairy Pans. And tho' it is generally allow'd that Vessels of Brass give less Impression to Liquors, than those made of other Metals, yet we may be assured Brass has some Effect upon Liquors, and especially the Juices of Animals when they are warm; for to apply the Hand when it sweats to a piece of Brass, though it be never so well polish'd, it will in less than a Minute occasion a most ungrateful Scent like that of *Aqua fortis*, which

which will remain upon the Hand for a Quarter of an Hour. Besides which, I could produce many other Instances of the like nature if it was necessary, to prove that Brass has an Effect upon Liquids, and chiefly such as proceed from Animal Bodies.

The Use of brass Vessels, however, I found had been a Custom of so long a Date, that it was with great Difficulty I prevail'd upon a few to try the Method of the *London Dairies*, viz. to use glazed earthen Pans, in lieu of brass Vessels, and to avoid the Smoaking of the Milk over the Fire, by using a Churn, which many of them had never heard of till that Time; but tho' some few have try'd this Way, and found their Account by it, yet is it so difficult to overcome the Prejudice of Education, that I do not find many who have had Resolution enough to trust their Senses, and correct the Errors of that Part of Farming, which in some Places in *England* might be render'd the richest Branch in Husbandry, and be of a private as well as publick Benefit; for certainly those who excel in the Management of the Dairy have their private Gain, and may be generally useful as Examples, or in giving the World such Goods as cannot fail of a suitable Reward.

One of my Correspondents computes, that Butter, Cheese, and the Product of Milk, amounts to more than an Eighth Part of the Money gain'd by Farming in *England*; and he adds, that the Money to be gain'd by this Branch might amount to much more than it does at present, if all our Country Dairies were to follow the Examples of those who excell'd the most in the Dairy Way. I confess, that I agree with him so far as the Dairy Management is concern'd; but

but on the other hand, we must consider what is before related, that Soil, Grass or Herb, and the Nature of the Kine must first be exactly taken care of; and where these all concur, I find the *London* Markets will give in the Value of one Pound Weight of Butter, four Pence or five Pence more than it would bring, if it was wanting of any of these Helps: So that Butter well made, cannot fail of raising as much Money, as will gratefully reward the Care and Industry of the Farmer.

Of Cheeses we may observe many Varieties, partly from the Dairy Management, and partly from the Food of the Cattle: It would be well worth the Farmers while to collect the several Receipts for making Cheeses, from the most noted Places, and in a particular manner to observe, that in such Cheeses as are design'd for keeping, the Curds are broken very small, and as equally as possible, that when the Cheese is put into the Fatt, every Part of it may be equally press'd, so that never a drop of Whey may remain in it; for 'tis for want of this Care, that we so often find Cheeses full of those Hollows which are call'd Eyes in Cheese, and occasion great loss to the Farmer.

I am inform'd that in *Wales* it is common to mix the Cows Milk with that of Goats, Sheep, Mares, or other Cattle. I have there tasted excellent Cheese, exceeding those of *Cheeshire*, in high Flavour and Richness.

I remember a *Dutch* Merchant once told me, that he had sent some of the best *Holland* Cheeses to the *East-Indies*, and receiv'd one of them back in greater Perfection than he had ever tasted any. His Method was to lay them in Oil, and stop them close up in earthen Vessels;

fels, which, he says, helps them extreamly, when they are about passing the Line; where the Heat is so great, that Cheeses are commonly lost by it, without such Caution as he used. One of my Acquaintance is often at the Expence of *Canary* Wine to keep his Cheeses in, which renders them very mellow, especially if they have the Help of moderate constant Warmth, about a Fortnight before they are cut. The Angelots might surely be made as well in *England* as elsewhere, seeing we have in some County or other, the same Food for Cattle that other Countries afford.



C H A P. IV.

To Mr. A. B. concerning the Management of a Piece of Ground about one Acre; with some Observations relating to Fish, Poultry, Rabbits, and preparing or curing of Pork and Bacon, adapted to the Service of a Family of Seven or Eight Persons.

S I R,

According to your Desire I am set down to give you my Thoughts concerning the Advantages you may reap from the Piece of Ground which you design to make into a Garden of Profit. And first, I shall prescribe the Method of fencing that Part of your Ground which lies next to the River, so that the brisk Current

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Current of the Stream may not continue to wash away any of your Ground; and even by the same Means you may recover that Ground which you have already lost by the quick Course of the River.

When you have found how far your original Bounds have reach'd, provide long Setts or Stakes of Willow, rather with their Tops on than to have them cut off, as the common way is, unless there should be Occasion for any Force to drive them into the Ground, and then the Tops cannot remain on them; but for the way of Planting them, it is commonly done by Means of an Iron Crow, or a Pole guarded or pointed with Iron, to make the Holes for them.

These Holes should not exceed a Foot distance from one another, and the Setts put in a Foot or more into the Ground, or two Foot if possible; when they are all planted, wattle them with Willow Twigs together at the Top, and in two or three Years the Stems will become so large as to meet within seven or eight Inches of one another, and in five or six Years within two or three Inches, if they like the Ground.

In the mean time the Current of the River, which formerly annoy'd and wash'd away your Land, will be resisted and diverted from its wonted Violence by the living Fence of Willows, and you will have Time to fill up the intermediate Vacancy between the Land and the Willows with Rubbish or such-like Materials as will lay a sure Foundation for the Recovery of your lost Ground. Some of my Acquaintance have planted such Spaces with Willows, at first, which by Degrees have fill'd up the whole Vacancy. These Hints, I think, are necessary first to be consider'd, that your Land may be
safe

safe before you plant upon it. It has been practis'd with great Success.

But as all Rivers are enclin'd to rise or fall in their Waters, we may chuse those Seasons of filling up the Vacancies between the Land and the Willows, when we least expect Floods and Inundations, that the Earth, or other Matter, which we lay to fill up such Places, may have due Time to settle and fix it self before the Rivers encrease their Waters too much; for fresh-laid Ground will wash away by every little Motion of the Waters: 'Tis then loose and light as Wheat-flour, which will fleet upon the Water; but when it has had Time to settle and fix it self, is like Flower made into a Paste, which then has its Parts so closely bound together, that Water can hardly separate them in a long Season.

I advise the Willow-Setts to be planted rather with their Heads on, than to have them cut in the common way, because this Cutting robs the Sett of its Freedom in circulating its Sap; for we must consider many Vessels, which are known to convey Sap, must lose their Office by pruning or cutting; and when a Plant is put into the Ground without a Root, 'tis always necessary to preserve as many Vessels entire as possible; for by Experience we find, that the less a Plant is wounded, the better 'twill grow: And for this Reason we practise the cutting and wounding of Fruit-Trees, which shoot vigorously, to check them, and bring them into a bearing State; for such wounding takes off the Vigour of the Tree, and brings the Tree to that moderate way of Growth as makes it produce Fruit; but in the Case of Forest-Trees or Willows, where Fruit is not our Design, but
encrease

encrease of Bulk is our chief End, every thing should be done to advance their Vigour. If some Gardeners do not come into this Measure of Thought concerning the Circulation of Sap, it is not so much their Fault, as the want of Knowledge in Anatomy ; for without they knew what the Circulation of Blood is in Animals, 'tis impossible they should understand what the Circulation of Sap is in Vegetables.

Altho' I have many more Experiments by me than are necessary to convince a Man of Learning, I am still directing many more in a plainer way, to convince those who are yet ignorant of it ; and I shall in some of my succeeding Writings publish my Thoughts upon it in such a manner as may render the Doctrine of the Circulation of Plants easy to every Gardener ; the Experiments now concerning it lying as widely distant from one another as Words in a Dictionary ; which though, at present, every one singly has its Meaning, yet as they are now plac'd, have no Coherence, nor can be render'd of Use till they are put together in due Order.

But let us now proceed to the Garden it self. Near the River-side, you tell me you have a Canal of One Hundred Forty Foot long, and Twenty Five Foot over ; and this, you say, has either at present, or may have, a constant Communication with the River, by means of a Wheel which the River may turn constantly, and will throw Water into your Pond : Now it is certain, that where such a Current can be maintain'd, a Pond of the same Size will feed and keep half as many more Fish as it would do. if it was only standing Water, or fed by a little Spring ; for in the constant Course of the
River-

River-water through it, there will be a constant Supply of Feeding-Matter brought in with the Water, which will be both grateful and nourishing to the Fish; and especially, if your Canal be so made, that the Fish in it are given to breed; but that should be always avoided, where we would have our Fish thrive and grow large: And if we would prevent their breeding, it is necessary to let the Sides of the Canal be cut downright, and fenc'd up with Plank, so that there be not any Part of the Canal less than two Foot deep in Water at least; for a Water of that depth will never hatch any Spawn of Pond Fish: And then if we take this Care of our Fish, rather to make them feed than increase, we must also provide some deep Places in the Canal, of about six or seven Foot Water; for it is a certain Rule, that all Fish, in proportion to their bigness, will chuse to lie in the shallowest or deepest Waters; the very small in the very shallow Places, and the very large in the deep; and without such Deeps, the very large will not thrive.

In a Pond of the bigness you mention, if the River was not to feed it, you might maintain about fourteen Brace of large Carps, and twice as many Tench, to thrive well; but as the Pond is fed by the River, you may well enough maintain twenty one Brace of Carps, and forty two Brace of Tench, and expect them to prosper, without giving them any extraordinary Feed; but for the sake of the Pleasure it may be to you in viewing your Fish now and then, it may be proper enough to use them to feeding at some certain Hour every Day, that you may take them as you see convenient; they will soon know you, and come at any Call you use them

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them to, as I have often seen in many Places : And if among your Carps and Tench you was to put some Trouts and Bream, they would become as tame and familiar as the rest. I am assur'd by a Gentleman of known Integrity, that at or near *Salisbury*, some Years ago, he has seen Fish made so tractable, that every Evening they would leave all Quarters of the Pond, and come to their Feeding-place, where every Night they were lock'd up, so that the Pond could not well be robb'd : The Trouts which were usually fed at Sir *William Bowyer's* near *Uxbridge*, and the large Jacks or Pike at the same Place, which would come to one's Hand, are Instances of the easy taming of Fish, and are known to almost every one who has been near the Place.

I have seen Carps thus tam'd, fed with Rasps of Bread, with Green Pease, and at *Rotterdam* with Spinage Seed, which they eat very greedily ; but the Trout is commonly fed with Paste made of Wheat-flour and Water.

The late Queen *Mary* had a Présent of fine Fish from *India*, which were not more extraordinary for their Scarlet and Gold Colours, than that they liv'd for a long time in a large *China* Bason ; and I am assur'd by some Persons of Honour, that they were so tame that they would eat out of the Hand small Pellets of Paste, with which they were fed once a Day.

And my own Experiment of hatching the Spawn of Fish in little Pans of Water, and bringing them to feed when I call'd them to me, confirms, that we may tame them, and bring them to our Hand at Pleasure.

When you store your Pond, put in the smallest Fish you can get, rather the Spawn of one

Year than of two, or rather of two Years old than three, for the younger they are when they change the Water, the better they thrive; nay, a Fish put in at three Years old, will not at six Years be so large as a Store-Fish put in at one Year old, will be in three Years.

The Feeding of Fish has yet another Convenience in Ponds where they breed; for the small as well the great will come to the Feeding-place at the Feeding-times, and may easily be taken with a Net, and remov'd to other Ponds without the Trouble of laying our Ponds or Canals dry; and it is necessary that we every Year discharge our breeding Ponds of the young Fry, or the greatest part of them, for they rob the greater Fish of their Nourishment, so that they do not grow half so much as they might do. An Instance of this kind I observ'd in the little Pans in which I hatch'd my Roach, Dace, Bleak, &c. for tho' they had Earth at the bottom of the Pans, and fresh River-Water every other Day, besides Wheat-flour, grated Bread and Paste, yet, in *September*, my Fish were not above half as large as those that were hatch'd in the River, and had the Liberty of natural Food. Thus far we may discover, that 'tis not our Interest to crowd Ponds with Fish, for if a Pond be over-stock'd, the Fish never thrive.

In the Spring Season, when Frogs and Toads begin to appear, suffer as few as possible in your Carp Ponds, but destroy them before they spawn, so that they and their Generation perish at once; for whether these horrid Animals do Mischief or not to the Carps, by poisoning of them, as is reported, they certainly rob the Carps of great part of their Food.

'Tis

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'Tis said, that Frogs and Water-Toads; at the Time when they commonly generate, will fix themselves upon the Heads of the Carp, and there remain till the Carps die: On the other hand, I have been told, that Carp are poison'd by eating the Spawn of these Creatures; however, 'tis seldom that Carps thrive where there are many of these ugly Creatures.

'Tis likewise improper to have any Eels in a Carp Pond, whether the Pond be for breeding or feeding, for they are great Devourers, especially of the Spawn of Fish; unless indeed a Pond be over-power'd with Frogs and Toads, and Fish do not breed in it, then the Eels will help to destroy those Vermin.

From some late Observations, I am apt to believe, that the Eel is viviparous; that is, it brings its Young alive into the Water, contrary to other Pond-Fish; for about the *Bury in the Mire*, the Fishermen take an Eel-like Fish about *Christmas*, that has then its Belly full of live young Ones, almost as small as Hairs; and about that Time of the Year, the River and Pond Eels are all bedded in the Mud, or folded over one another, which, I suppose, may be their way of generating; and I wish about that Time some of them were examin'd, for it is yet uncertain how they breed.

But let us now see what Profit you may expect from your Canal, which contains about twelve Rod of Water. We shall suppose that all the Fish you stock your Pond with, are Spawn of one or two Years old; and three Years after stocking your Pond, if it feeds pretty well, your Carps will (at a moderate Price) be worth 2 s. apiece, and your Tench 1 s. per Fish; for these are rarely brought to Market but in *London*.

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and even there the Prices I set are not esteem'd dear.

| | <i>l.</i> | <i>s.</i> | <i>d.</i> |
|--|-----------|-----------|-----------|
| Then your forty-two Carps are } worth | 4 | 4 | 0 |
| And your eighty-four Tench — | 4 | 4 | 0 |
| Which makes | 8 | 8 | 0 |

Now this Sum alone, divided into three equal Parts, shews us how much the twelve Rod of Water will gain by the Year, which is upwards of 2 *l.* 13 *s.* *per. Annum*, which is very profitable.

Now, if you will suffer your Pond to breed, then it may be stop'd on the side, and save you the Expence of boarding it : But whether it be done one way or other, if the River runs thro' it, you may have Cray-fish in it, which is yet an Improvement. If it is boarded on the sides, then there must be some Holes left in the Boards for the Cray-fish to lodge themselves in the sides of the Banks, for there is their Residence ; but if the Banks are stop'd, then 'tis so much the better, and the Cray-fish will increase the more, as we may observe in those Rivers where Cray-fish are the most frequent. If they should happen to breed in your Canal, they will be very numerous in a little Time ; and if they are agreeable to you, either for your own eating, or to dispose of otherwise, you will find an extraordinary Advantage from them ; they will thrive well in any Trout River : Their common Price about *London* is 8 *s.* *per. Hundred*, which will surely make your Canal worth 4 *l.* *per. Annum*, or more Money, if you mind to supply it with young when you take

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take away the old Fish, or take care that your Water is not over-stock'd.

Upon this Water you may likewise keep six Couple of Ducks, which for laying early and bringing forward Encrease, should be of the nook'd Bill sort, and from that Kind one might have young ones fit for killing about the latter end of *March*, as I have seen this Year sold in the *London* Poulterer's Shops for 2 s. apiece; but supposing every one of the Young they will produce, worth 1 s. at the first Hand, I think one can hardly reckon less than 40 s. for the Encrease of six Couple of Ducks, deducting all Hazards and Expence of feeding them.

Now I suppose those which you keep till they are full grown, will not be of less worth to you, because (as you will have a Warren, and many Offals besides the Entrails of Rabbits) there will be no great Quantity of Food to be bought in for them: But where many things depend upon one another in this manner, 'tis the Care; and Industry, and the Master's Eye, which makes the Profit; for 'tis like a Watch or Clock, which depends upon many Wheels, and will, while they move regularly together, mark to us the Hour of the Day, and do its Office punctually; but if any one Wheel be out of Order, the whole Machine stands still. In Farming, where we have many Things to think on, which depends upon different Management, I think we should always carry about us a List of the Subjects we have under our Care, and mark out the Time of the Day when we should visit each Particular; and by such a Method our Memory will be free and undisturb'd, and our Business be done with little Trouble.

But I have now done with your Canal ; I shall in the next place give you my Thoughts concerning your other Pond or Moat, wherein you propose to keep Pikes or Jacks. I suppose I need not tell you, that they are the most voracious Fish that the fresh Waters produce, even so greedy as to prey upon one another, as I have more than once observ'd. If the Water Toad or Frog should in that Pond chuse their Habitation, the Jack will be sure to fill his Belly, but his Flesh is never the worse for that : The Fish which only can keep him Company without Danger, are Eels, Flounders, and the Pearch ; the two first are as voracious as himself, and have a constant Guard over themselves ; for their Abode is always in the Mud, leaving only an Hole open at the Mouth, at which they suck in their Prey as it passes by. In my Earthen Pans which I have mention'd, where I hatch'd my Fish, I had some small Eels, not thicker than coarse Thread, which for six Months were always bury'd in the Mud or Earth at the bottom of the Pans, and only a small Hole open in the Mud where their Mouths lay. I have often seen them take a Fish as it was passing by them, and if I had not chang'd my young Fish into other Pans, I should have lost them all.

In other Pans I had some young Flounders, which were hardly bigger than Silver Pence, bury'd in the Mud like the Eels, and those too drew in my young Fish, and impair'd my Stock as much as the Eels, so that I was forc'd to put my scaly Fish by themselves. But what was remarkable enough, I found that in every Earthen Pan, where I put the Tribes of young Fish, there was always a young Jack or Pike, which
lay

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lay constantly in one place, where he had made himself a little Shelter; I could never observe him stir but when he struck at the Fish as they were passing by him, and for this Reason I was forc'd to put my Pikes in Pans by themselves, and now and then sling them a few of my other Fish; for the Pikes, little as they were, were as voracious as the largest of their Tribe.

Observing that in every Parcel of Spawn that I had taken out of the River, there was always a young Pike among them; I began to question whether the Pike, when it laid its Spawn, did not lay it in Parcels among the Spawn of other Fish, that its Young, when hatch'd, might be immediately in the Way of its Prey; if so, the common River-Fish are never safe, either in the Egg, or after they are hatch'd, their Destruction is premeditated.

Now the Guard which Eels and Flounders have against this Tyrant of the Water, may reasonably lead you to make them Inhabitants of the same Pond; and if he should be hungry enough to attempt them, they have the Mud at command against the Pike, and every one knows the Pike delights in clear Waters.

The Pearch may likewise keep the Pike company in a Pond, for the sharp Fins on a Pearch's Back arms him too well to invite the Pike to attempt him; but wherever these Fish are together, they should have Roach and Dace for their Support, and some Water-Weeds should be planted for their Shelter and Nourishment; for where there are Water-Weeds, there will also be Water-Insects, which help the Feed of Fish. If your Pike are large, take Care of your young Ducklings, for the Pikes will prey upon them.

When your Ponds are thus provided, you need not make a Stew Pond for Fish; for by feeding your Fish daily, you will have them at your Command at any time in this Pond; likewise, if the River passes thro' it, I would advise you to put in some Crayfish; and as it is near as large as your Canal, one may justly reckon it to be worth 3 *l. per Annum*. I would certainly contrive to have the River run thro' both: Besides the Benefit of the Wheel, which need only be used now and then.

You may put into such a Pond at the least about forty Eels, and as many Flounders, about ten Brace of Pikes, and as many Pearch, and your Eels will never taste muddy.

While I am giving you these *Memorandums*, I think it necessary to remind you of, trying Mr. Harding's Water Wheel; for I am persuaded it will be of great Use to you.

As far as I am yet gone with your Garden, it appears, that about twenty two Rod of your Ground turn'd into Water, will afford you the following yearly Profit, *viz.*

| | <i>l.</i> | <i>s.</i> | <i>d.</i> |
|--|-----------|-----------|-----------|
| Your Canal Fish, consisting of Carp, Tench, Cray-fish, besides Trouts and Bream, is worth about | 4 | 0 | 0 |
| Your yearly Benefit by Ducks | 2 | 0 | 0 |
| Your yearly Benefit from your Moat, or other Pond, by Eels, Pike, Pearch, Flounders, and Cray-fish, about | 3 | 0 | 0 |
| In all about | 9 | 0 | 0 |

Now

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Now this, I think, is a very good Return for so little Ground, and there yet remains one hundred thirty eight Rod of Ground of your Acre to be improved otherwise.

I observ'd by the Draught of your Ground, that your Orchard Trees take up about, thirty eight Rod of Ground, or are so dispos'd, that such a Quantity of Ground will bear little else for Profit; for the Grass in such a Spot, did it lie all together, would not be worth above 5s. a Year at most, because of its rank and sour Taste.

Let us suppose then, that in the thirty eight Rods of Ground, there are as many Trees of good sorts of Apples and Pears, as there are Rods in Measure; these Trees, if they are well grown and in good Order, as you seem to intimate, may, at a very low Rate, be reckon'd worth 5 s. a piece each Year, one with another; even as the Case is now, where by injudicious Management of Trees, they are so subject to fail.

I have known some Standard Pear-Trees, that have brought a good Crop of Fruit every Year, when they have not been prun'd; or known a Knife, when others that have been cut have not had any Fruit; some Pear-Trees I have known, that have been singly so good, that the Fruit has been sold for 2 l. per Tree each Year, others for 1 l. per Tree; and some Apple-Trees, which have singly born Fruit worth 1 l. a Year about *London*. Now considering that the Plenty of Fruit depends chiefly upon the good Management of the Trees, it is well worth our while to have good regard to that. In the Western Parts of *England*, where Apples are very plentiful, and are of the cheapest Price, a good bearing Tree can hardly be worth less,
one

one Year with another, than 5 s. And this Rate in general for all Trees that are healthful, I think, is moderate enough; therefore if thirty eight Crowns, or 9 l. 10 s. be the Gain of your Orchard at this Price, then from sixty Rods out of your Acre in Water and Orchard, you have 18 l. 10 s. *per Annum*,

I know very well, that when Fruiterers go about the Country to buy Orchards of Fruit, their Price is not always at this Rate; for they run the Hazard of Loss, either by Blasts or high Winds; they are at the Expence of Gathering, Carriage, and House-room to keep the Fruit 'till the proper Season for exposing it in the Markets; and then there may be a great Loss by untimely or accidental rotting of the Fruit; so that their first Price in the Orchard cannot be above half as much as perhaps the Fruit will sell for in the Market: But then if Gentlemen have no more Fruit than what they can use in their own Family, or oblige their Neighbours with, the full Market Value is in that Fruit, and amounts to much more than what I have mention'd.

But let us now examine the Profit of the Warren you design, which is to include four Rods of Ground; in that you may keep ten Couple of Does, and two Buck-Rabbits. The Buck-Rabbits must be chain'd in a cover'd Place where the Does come to feed, and by no means suffer a Male Rabbit to live unchain'd, without it be castrated, for else the Male Rabbits will eat the young ones; and 'tis for that Reason, that the Doe Rabbits in wild Warrens lay their young ones in By-places under Ground, and cover them up 'till they can shift for themselves.

The

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The castrating of the Male Rabbits will moreover render their Flesh as agreeable as that of the Female, and they will be much larger and more tender.

| | l. | s. | d. |
|--|----|----|----|
| The eleven Couple, with their Off-spring, will eat about four Quarters of Bran in a Year, or forty eight Bushels, which at 9 d. per Bushel, comes to | 01 | 16 | 00 |

| | | | |
|---|---|----|----|
| And twelve Bushel of Oats will be as much as is necessary for them in a Year, which at the dearest Rate, are 16 s. per Quarter; so that the Amount of Oats is in a Year | 1 | 04 | 00 |
|---|---|----|----|

| | | | |
|--|---|----|----|
| The Hay which they may require perhaps will come to at most six Trusses, at One Shilling each, which makes | 0 | 06 | 00 |
|--|---|----|----|

| | | | |
|--|---|----|----|
| Thus we find our yearly Expence for the Maintenance of the Warren is | 3 | 06 | 00 |
|--|---|----|----|

The rude Cabbage Leaves, the Turnip-tops, the Carrot-tops, and the Weeds which too frequently annoy a Garden, will make up to them what is necessary.

The twenty breeding Does will, if they are well fed, bring at least six Stops of young ones each every Year; but some who now keep Rabbits at *Hammer-smith*, have about nine or ten Broods of young Rabbits in a Year. Their Way is, when a Rabbit kindles, to leave only five young Rabbits to each Doe, and destroy the rest; for they reasonably judge, that more than that Number will weaken a Doe so much,

that

that she will not breed so often as she should do for their Interest. Now if your Rabbits breed only six Months in the Year, which is to suppose the least, and that you was to save only five of a Kindle to each Doe, you would have in a Year six hundred young Rabbits; which, one with another, to follow the Price of the *Hammer Smith* and some other Rabbet-mongers, would sell for Six-pence a piece at a Month old, without consuming hardly any Hay, Bran or Oats; so that then your Warren would afford the Value of 15 *l. per Annum*.

Out of which, if we take 3 *l. 6 s.*

| | | | | |
|--------------------------------|---|-----------|-----------|-----------|
| which is the Charge of their | } | <i>l.</i> | <i>s.</i> | <i>d.</i> |
| extraordinary Food, there will | | 11 | 14 | 00 |
| remain neat Profit | | — | | |

| | | | | |
|----------------------------------|---|----|----|----|
| By which with the Profit arising | } | | | |
| from Ducks, Fish, Fruit, &c. | | 30 | 04 | 00 |
| you are a Gainer, | | — | | |

And the Intrails of the Rabbits will always be of Use to your Fish, if you bestrow them in the Water while they are fresh, or else the Fish will not eat them. But we have yet remaining ninety six Rods of Ground: You very well know that Rabbits, when they are about three or four Months old, are very large, especially the Males that have been castrated; and then they are worth more than I have mentioned, as they feed upon the extraordinary Diet.

In what I have said, I speak of Things at their lowest Rate; for to mention them at a retailed Price, they would come to near double the Value.

When you build your Warren, provide that the Ground fall a little, and lie hollow in the middle, so that the Rain may easily pass away, and that the Floor may be wash'd, if there is occasion; when



... a more occasion ;
when

when this is done, pave it all over with Brick or Stone, and build your Wall about it a little more than three Foot high, and upon that place Palisadoes. Then two Foot and half from the Wall within side, build Walls of about a Foot and half high, leaving Openings or Holes wide enough for Rabbits to go in and out, at a Foot Distance from one another; so you may have about twenty Holes on a Side; for tho' you have but ten Couple of Does, the young ones must shift in Cells of their own, when they are about five Weeks old, if you keep them so long.

Between the Holes you must put Partitions of Boards to separate the Cells; and let all these Boards be of the same Depth, because over them must be Doors on Hinges to lock down, as you think proper; and over these Doors likewise there must be a sort of Roofing of Feather-edg'd Boards, to lie sloping from the Warren Wall to the other, so as to carry off the Wet; and these likewise should be made to open and shut at pleasure. We have then little more to do than provide Boards to let down before the Holes, as Occasion shall offer, to confine the Rabbits in their Cells, or preserve them in the Night from Vermin.

But to explain the Manner of the Warren more fully, a a a in the Figure is the Wall which encompasses it.

A A A is the little Wall or Front of the Cells on one side, in which are the Openings or Entrance into the Cells.

B is the Roofing of Feather-edg'd Boards shut down over the Cells, to preserve them from the Wet.

C C the Feather-edg'd Boards are open'd to come at the Doors over the Cells, which should be kept lock'd.

D a Place of the Shelter from the Weather, wherein two Buck-Rabbets should be kept chain'd for the Use of the Does; and likewise under this Place of Shelter should be kept the Meat for the Rabbets as dry as possible, but should be as light as may be: It may be made like an Alcove; but every one, as their Fancy leads them, may vary the Figure.

E E E shews where the lowest Part of the Pavement should be, or the Gutter to drain the Floor of the Warren; which when it comes near the Feeding-house, should turn off to the Corners.

I shall in the next place suppose ten clear Rods of Ground are employ'd between your Barn and House, in the nature of a Farm-yard, and in this you will keep your Poultry; which in the Spring, about Breeding-time, may be about twelve Hens and two Cocks, six Hent Turkeys, and one Cock; these, could they have a Communication with your Orchard, would save you a third Part of the Food you must otherwise give them, if they were to run only in the Farm-yard; about half a Bushel of Barley may do in a Week for such a Number of Fowls for half a Year, and a Bushel for the other half Year.

Barley is about 14 s. per Quarter;
 so that then one half Year will
 take thirteen Bushels of Barley;
 which at 14 s. per Quarter,
 comes to about

l. s. d.

or or or

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l. s. d.

In this half Year our chief Profit
is in Eggs, which, I suppose } 0 05 00
may be worth about

But if we are fortunate enough to have some
Broods of Chickens, which may be fit for kil-
ling, either about *Christmas*, or from that Time
'till the End of *May*, the Markets at first hand
will value them at a Shilling apiece, and to judge
at the lowest Rate, I think if we reckon twenty
Chickens of that Kind, we are not much out of
the Way. The Value then of Eggs and Chic-
kens will be 1 l. 5 s. and I shall not suppose,
that above three Hens are employ'd in the Edu-
cation of these Chickens. Then we have nine
breeding Hens for the Benefit of the other
half Year.

Their waste Eggs may be valued } l. s. d.
at 1 l. which with their Chic-
kens, reckoning eight to every } 2 16 00
Hen, one with another, at 6 d.
per Chicken, comes to

To which if we add the former }
Gain by early Eggs and Chic- } 1 05 00
kens

Our total Amount in one Year is 4 01 00

But the Price of the Barley for one }
half Year, is 1 01 06

The Price of the Barley for the }
other half Year at a Bushel per } 2 03 06
Week, is

Expence then is 3 05 00
Which 3 l. 5 s. being deducted from 4 l. 1 s.
there remains neat Profit 16 s. which being ad-
ded

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ded to the other Profits by Fish, Rabbets, &c. makes 31 l.

The Turkeys, if they are well manag'd, may in Eggs before they Set, yield 10 s. and out of six Hens, reckoning all Hazards, we may expect about eight young ones to be brought up by each Hen; and tis no extraordinary Price to reckon them at 1 s. and 6 d. apiece, one with another, then we have forty eight young Turkeys, which come to 3 l. 12 s.

| | <i>l.</i> | <i>s.</i> | <i>d.</i> |
|---|-----------|-----------|-----------|
| Which with the 10 s. for the Turkey Eggs, makes | 4 | 02 | 00 |
| To which add the 31 l. gain'd as above, by Rabbets, Fish, &c. | 35 | 02 | 00 |
| there will be clear Profit, besides the Stock | | | |

After this we find you have remaining eighty seven Rods of Ground, still to be improv'd by Gardening.

I am told, that I undervalue the Things I mention; but I think it much more reasonable to do so, than set the Prices too high; because any one who follows these Prescriptions, may have the Pleasure of an unexpected Advantage, rather than find Fault that my Calculations are too high rated. But I am sure, that if all I have treated of in this Letter be used in the Family, they will be near twice the Value I have set down.

While I am upon the Topick of Country Advantages, I shall give you some *Memorandums* relating to the Curing of Pork and Bacon, which will admit of as much Enquiry, and I think will be of as much Use, as any thing I have treated of in this Letter.

Some

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Some time since, when I eat some pickled Pork at the House of one of my Correspondents, I found his Method of curing Pork to be much superior to the common Way; and one has this Advantage in communicating good Things, that sometimes we find some Pleasure from them in remote Parts, where before every thing was rude and unpolish'd; for this Reason, I prevail'd upon my Friend to give me the following *Memorandums*.

First, The Hog must be full half a Year, or at most nine Months old; for its Flesh will then eat kindly, and take Salt better than if it was older.

Secondly, When we are disposed to fat a Hog, besides his common Meat, we must give him a Quart or three Pints each Day of Horse-Beans; this we may continue for six or eight Days before he is put up for Fattening.

Thirdly, When he is thus prepared for Fattening, we are to take Care that he never wants either Meat or Water, and bed his Sty well with clean Straw, or Pease-haulm; he will eat at first about three Quarters of a Peck of Pease in a Day, and decline in his eating as he grows fat; about two Bushel and a half of Pease, or three Bushels at most, will bring him into good Order for killing, without making him too fat.

I find then that scalding is much better than singeing him, for by scalding the Pores of the Skin, are much more apt to receive the Salt, than the singed Hogs.

When this is done, let him hang up a Day before we cut him out, and then sprinkle some common Salt over the Pieces to draw out the fresh Blood from the Flesh; for by this Means, your Pork will take Salt the better, and keep

the longer. And some will likewise take out the larger Bones, which, they say, helps to preserve it; for 'tis about the Bones that it first begins to grow musty, or receive a Taint.

After this, we must provide half a Peck of common Salt, a Quarter of a Pound of Salt-Petre, one Pint of Petre-Salt, and half a Pound of coarse Sugar. These Quantities I use for a Hog weighing about fourteen Stone.

These Ingredients must be well mixed together over a Fire in an Iron Pan, and when they are very hot, Salt the several Pieces of Pork with them, without grudging a little Labour; for the harder we rub these Salts upon them, the surer we are of Success. I have known a little Carelessness in the rubbing on these Salts, has spoil'd a whole Hog.

When we have done this, lay the Pieces close together in glazed Earthen Vessels, and cover them close during the first Fortnight, except only at such Times as it should be turn'd, and fresh rubb'd with the Salt, which ought to be every other Day; and when we put them again into the earthen Pans, observe that those Pieces which before lay at the Bottom, do now lie at Top, and so change them every time you take them out.

In ten Days or a Fortnight's time, some of the smallest Pieces, if they do not feel hard to the Touch, must have more Salt rubb'd upon them, and in three Weeks time your Pork will be fit for Use.

If we should not change our Pork in the Time of its Salting, as I have mention'd, we should find that those Pieces which lay at the Bottom would be fit for Use, when those on the Top would hardly be better than common
Pork

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Pork, or perhaps not so good. Where this changing of the Pieces has been neglected, I have known the Receipt despised; for there was never any but those Pieces which were at the Bottom, that answer'd the Design of the Receipt.

I remember once, by Mistake, there was put in among the Salts three Quarters of a Pound of brown Sugar, instead of one Quarter of a Pound, and in the Opinion of very good Judges, the Pork was better than any they had tasted in *England*. I think for the larger Pieces, it renders them more tender.

Thus far are the *Memorandums* concerning the Curing of Pork; and as I am upon the Subject, I cannot help communicating to you the following Letter from Mr. *Warner*, of the Method used by the People of *Hamburg*, and in *Westphalia*, for drying of Bacon, in which chiefly the Goodness of their Bacon consists.

Friend Bradley;

THY Favour of the 30th ult. I receiv'd; in Answer to which, I send thee the Method used to cure Bacon in and about *Hamburg* and *Westphalia*, which is after this Manner: Families that kill one, two, or three Hogs a Year, have a Closet in the Garret joyning to their Chimney, made very tight and close, to contain Smoke, in which they hang their Bacon to dry out of the Reach of the Heat of the Fire, that it may be gradually dried by the Smoke only, and not by Heat; the Smoke is convey'd into the Closet by a Hole in the Chimney near the Floor, and a Place made for an Iron Stopper to be thrust into the Funnel of the Chimney about one Foot above the Hole, to stop the Smoke from ascend-

ing up the Chimney, and force it through the Hole into the Closet. The Smoke is carried off again by another Hole in the Funnel of the Chimney above the said Stopper, almost at the Cieling, where it vents it self. The upper Hole must not be too big, because the Closet must be always full of Smoke, and that from Wood Fires; for Coal, or Turf, or Peat Smoke, I apprehend will not do so well. The Manner of Salting is no other than as we salt Meat in common; sometimes they use our *Newcastle* Salt, or *St. Ubes*, or *Lisbon* Salt, and a Salt that's made at *Nuremberg* (not so good as *Newcastle*) made from Salt Springs; in those Parts they do not salt their Bacon or Beef so much as we do in *England*, because the Smoke helps to Cure, as well as the Salt; for I have seen when dry'd Flesh hath not hang'd long enough in the Smoke, it would be green within, when if it had hung its Time, it would have been red quite through; for as the Smoke penetrates, it cures the Flesh, and colours it red without any Salt-Petre, or any other Art. As to the Feed of their Swine, I saw no difference between their Feed and ours here; if any have the Preference, I believe the *English*, and our Bacon would be full as good, if not better than the *Westphalia*, if cured alike.

I have here above answered thy Desire, and wish it may be approved by our Bacon Makers; for the Bacon will not only be not so salt, but relish better every Way,

Thy Friend,

John Warner.

There

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There is one thing which I cannot help mentioning to you before I conclude this long Letter, and that is the Method of making the famous *Stilton* Cheese, which all that taste it allow to be superior to every other Cheese, either of foreign or *English* Make.

This sort of Cheese, in my Opinion, is far before the *Cheddar*, or other rich Cheeses. The Excellence of it seems chiefly to depend upon the Management in the Dairy, rather than upon the sort of Grass or Soil; for I have eaten Cheese made by the *Stilton* Receipt, at a Place near *Nottingham*, which came so near it in Perfection, that it would puzzle a good Taste to discover, whether it was not *Stilton* Cheese, and I conceive the Receipt will not be unacceptable; for I find that in our happy Country, the People have not always a right Method of shewing its Beauties; for I observe, where you have the best Fish in plenty, you have the worst Sauce; where you have the best Ground and the best Cattle, you have the worst Dairies; and like a Mine of rich Metal, 'tis often lost for want of Knowledge or good Management.

I wish, tho' you do not keep many Cows, you will begin in your Country to follow the Receipt I send you, which was communicated to me from another Correspondent, who signs himself *A. B.* and to whom I am much oblig'd for several very instructive Hints. For tho' your Number of Cows may not perhaps furnish you with the same Quantity of Milk which is mentioned in the Receipt, yet your Proportions may be the same, and the Rule of Management may be the same; and tho' a great Body in Cheese may afford some more Richness than a small Quantity may do, yet you cannot help

finding an extraordinary Excellence in a small Cheefe made after that Manner, preferable to all the Cheefe made the common way.

Stilton is in *Lincolnshire*, in the Coach Road to *Lincoln* from *London*, where at the Sign of the Bell is much the best Cheefe in Town; the Man of that House keeping strictly to the old Receipt, while others thereabouts seem to leave out a great part of the Cream, which is the chief Ingredient; but for all this, the Name this sort of Cheefe has got above others, makes it sell for 12 d. per Pound upon the Spot.

Receipt to make Stilton Cheefe.

TAKE ten Gallons of Morning Milk, and five Gallons of sweet Cream, and beat them together; then put in as much boiling Spring-water, as will make it warmer than Milk from the Cow; when this is done, put in Runnet made strong with large Mace, and when it is come (or the Milk is set in Curd) break it as small as you would do for Cheefe-Cakes; and after that salt it, and put it into the Fatt, and press it for two Hours.

Then boil the Whey, and when you have taken off the Curds, put the Cheefe into the Whey, and let it stand half an Hour; then put it in the Press, and when you take it out, bind it up for the first Fortnight in Linen Rollers, and turn it upon Boards for the first Month twice a Day.

You may see that I have not spared Paper, to give you the best Instructions I can towards your Enjoyment of a Country-Life: I am persuaded true Contentment lies in Retirement;
for

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for I am sure, as I have experienced, there is no such thing in the Publick; no, not among those who possess the greatest Riches: Ambition is crowded with Inconveniencies, either with vain Hopes, or Envy; whilst a Man, who enjoys Country Retirements feasts himself with Health and quiet Thought.

In my next I shall give you an Account of the Profits you may expect from the remaining sixty Rods of Ground, which I design for a Kitchen Garden.

I am, Sir,

Yours, &c.

R. Bradley.



C H A P. V.

Rules for Methodizing and Assorting a Parcel of Ground containing Sixty Rods, for the Use of a Family of Seven or Eight Persons, or for providing a Kitchen-Garden with Necessaries for Twenty or Thirty in Family; in a second Letter to Mr. A. B. to finish the Improvement of one Acre of Ground, with a particular Account of the sure Method of Raising MUSHROOMS as they do in France.

• S I R,

ACCORDING to my Promise I here send you an Account of the Advantage you may reap from the Sixty Rods of Ground which I left undirected in my former Letter, by disposing it after the manner of a Kitchen-Garden.

Among the many I have convers'd with, of all Nations, and all Degrees, I find one Humour generally prevails in Point of Gardening; which is, That the more profitable a Garden is, the more it is admir'd; and the End of making and keeping a Garden, is, (besides the Advantage it will bring to the Master of it) the Pleasure of having every Fruit and Herb brought fresh to his Table.

In the Course of my Observations I have found this Design carry'd to a great length in some few Places; but on the other Hand, great Numbers have fail'd in the Execution of their Design, either by over-cropping their Grounds, or by wrong proportioning their Quantities of Herbs

Herbs or Fruit, or by neglecting to contrive a due Succession of their Crops.

The over-cropping or stocking of a Ground, in the first place, robs it of its Strength; and where Plants grow too close together, whether their Roots or Tops are to be eaten, they are always small and useless: The best Seeds of Cabbage-Lettuce will produce Plants of no Value, if they want Room; the Seeds of the largest Roots will produce nothing of moment, if they do not stand at a right distance one from another, which the Houghs us'd in the Gardens about *London*, will, in some measure, help to teach us. The Blades of the Houghs for Turnips are about five or six Inches wide, while those for Onions are but two Inches: But these Instruments I chiefly mention, because they are seldom us'd in the Countries remote from *London*; for when the first has gone through the Plants, though the Blade is but five or six Inches wide, yet the Turnip-Plants remain generally about seven or eight Inches asunder, from the irregular coming up of the Seeds; and so the Onions will, after Houghing, stand about four or five Inches asunder, which is full near enough, if we expect to have them good, and well-rooted; and even at such a Distance they will very well allow a good Draught to be made, during the Summer-Season, which will still help the remaining Plants to enlarge their Roots. So Cabbage-Lettuce, to have them good, should stand a Foot apart, if we plant four or five Rows in a Bed; but if they are planted in a single Row, we may set them nearer together; for every Plant which we expect to bring a large Head, must have Room for the Air to circulate freely round it; and if that is not allow'd, the

Plants will never spread, but run upright, and their Leaves will be watery and insipid.

The Roots either of Turnips or Onions, which commonly *apple* above Ground, are always larger, as they have more Room and more Air about them; and then the Leaves are short, and the Juices are employ'd principally in the Roots. So in Carrots and Parsnips, tho' they run downwards into the Ground, yet as their Green Tops spread more or less, their Roots are smaller or larger.

The second Mistake is the wrong proportioning the Quantities of these Esculent Herbs and Roots in a Garden, by which means we super-abound in one thing, while we are in want of another; and this happens chiefly from our judging wrong of the Nature and Design of the things we plant or sow, or of their Use at the Table, or the Time which every sort will last good.

We are to consider, that Pease will require more room than any other thing in a Garden, considering their Table-Use; for the Fruit of many Plants must go to make a Dish, and then a Crop of Pease seldom lasts longer good than Three Weeks or a Month; but then, because we must have many Plants, we are not to crowd them close together, for then we shall have a smaller Quantity of Fruit; and besides, the first gathering, when the Lines of Plants are too close together, breaks and bruises the Plants, so that they do not even bring a Quarter-part of their Crops to Perfection. I have experienced, that ten Rods of the Ronceval, and *Dutch* Admiral Pease, have yielded more Fruit when their Lines have been set wide enough asunder, and have been well stick'd, than three times

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the Quantity of Ground has done, where the Rows were as many more in Number, and twice the Quantity of Seed put into each Row: And besides, those that had room enough, have brought good Pease for above ten Weeks together, by being water'd now and then, and the Pease gather'd carefully from them, without bruising the Plants. But though we might reckon ten Rods of such Pease to be enough for a Family, yet when we come to provide Carrots, or such-like Roots, two or three Rods will prove much more advantageous than the ten Rods of Pease; for in the Roots there is little or no Waste, but there must be many Plants of Pease to yield as much profitable Eating as one Carrot or Parsnip will do. I suppose a Carrot-Root that requires about eight Inches Square of Ground, will fill the space of a Pint; and the profitable part of the Pease that require a Yard Square of Ground to grow upon, will hardly be more than half as much, considering what Air they must be allow'd; and so every Thing in a Garden, according to the profitable or useful part of it, should be consider'd.

Again, we ought to know what Herbs or Roots are chiefly used or coveted in any Family, and proportion our Stock of every sort accordingly; for otherwise, tho' our Garden be fully cropt, yet if the favourite Herbs or Roots are not in full Quantity to the Master's Will, the Blame will fall upon the Gardener, and thus, much of the Garden, though it be fully cropt, becomes useless. Therefore it would not be amiss for a Gardener to enquire, at his first coming into a Place, what Herbs or Roots will be chiefly expected or used in the Family, that they may be the Objects of his Care. And
this

this leads me to consider the neglecting to contrive a due Succession of Crops ; for in that Case we may lose half the Profit of our Ground, which ought never to lie idle ; for, by good Management, one Acre may be render'd as profitable as four or five with injudicious Management. Let us never be too late in preparing for our Winter Standing Crops, for we may lose a Third or Half Part of our Winter Store in Quantity, by a Fortnight's Neglect, and also the Goodness of our Crop will not bear any Comparison with such an one as has had due Time to strengthen it self. We should consider the Nature of the Plants we shall want, and when one sort begins to decay, turn up the Ground afresh, and renew it with another sort of Plant ; considering at the same time, that one Tribe of Plants does not draw from the Earth the same Nourishment that another sort will do ; and therefore always change the Tribes, and the Earth will have Nourishment enough for all, regaining what Strength she has lost by one sort, while she is distributing to the others. The sowing of Pease, then Turneps, and after them, Corn, is one Instance that Land will bear several Crops successively to good Advantage, without manuring ; but there are many more Instances to prove, that the Earth can never be render'd unprolifick, unless she is constantly constrain'd to feed one kind of Herb or Plant.

After these Hints I shall proceed to a more particular Enquiry into the necessary Furniture of a Kitchen-Garden, for about Seven or Eight in Family ; which is the Proportion I chuse, for the sake of your Extent of Ground, and because there are more Families in *England* of about that Number than of any other, and because also I
have

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have been solicited by some particular Persons, to inform them of the Profit of a Garden for such a Family. What I shall say upon this Occasion, may likewise assist in the Accounts I shall give hereafter of the profitable Production of larger Gardens: But I must give this Caution with my Calculations, That bad Seasons, and other Accidents, must be allow'd for, they may sometimes cross our Expectations.

Sixty clear Rods of Ground is such a Piece of Land as will very well supply a Family of about seven or eight Persons with every thing necessary; the Standing Crops, or such Herbs, Roots, and Plants, as are to remain for a long time in one place, should be included in such a Parcel of Ground as we design for Hot-Beds.

For the Hot-Bed Ground we may allow four Rods of Land, after the Rate of sixteen Foot and a half Square each Rod. In this Piece of Ground, when it is fenc'd, we may employ four Frames, with three Lights apiece, for the Production of our earliest Cucumbers and Melons, and for the Raising our Annual Flowers, to be planted for Ornaments in the Borders among the Fruit-Trees: The Method see in my *Kalendar*. In this Place, though we employ only four Frames, yet we must set apart two Rods, that we may have room to shift the Frames or Hot-Beds, so as to preserve a Succession of Heat to the tender Plants; and the other two Rods will serve for one Ridge of Cucumbers, and two of Melons, each Ridge two Rods long, and about five Foot wide, including the Allies. If we have two Ridges of Melons of this length, we may have about sixteen Holes of Plants, and upon each Hole, with good Management, we may have three or four good Melons at least;
so

so that our Crop may amount to about Thirty Brace, besides what we might expect from our forward Beds.

The Ridge of Cucumbers will bring a plentiful second Crop, that is to come in about the middle of *May*, when the first Crop in the Frames begins to decline ; but for the three Ridges we must have two dozen of Glass Bells at least. At the Back of the Frames we might also have a few Kidney-Beans ; but they must be well taken care of, lest they over-grow the Cucumbers and Melons. And upon the Side of one of the Beds, when it begins to cool, we may sow Sellery.

But besides the early and the second Crop of Cucumbers, we must provide some to succeed for the later Months, and those must be sown in the natural Ground. These are generally call'd *Picklers*, and for that Use should be gather'd as soon as the Fruit first appears. For this Use I shall allot two Rods of Ground ; but as this sowing is not to be till near the beginning of *May*, we cannot propose to inter-plant the Cucumber Holes with any thing, unless it be with Cabbage-Lettuce or Radishes, which will be off before the Cucumbers can hurt them.

Ground for pricking out of young Plants, and for young Salads ; three Rods.

The next Spot I shall take Notice of, is a Piece of Ground for pricking out of Seedling Cabbages, Savoys, Colly-Flower Plants, Sellery, Endive, Annuals, &c. and for raising young Salads upon : And for that Use I allow three Rods, which is sufficient for the Plants which are necessary to be rais'd for such a Family, till 'tis their Time to be planted out at due Distance.

stance for perfecting themselves. This Parcel of Ground will certainly contain a greater number of young Plants, than can be planted out for good in such a Garden as I mention; but as the Expence of a little Seed is no great Matter, we shall gain this Advantage by it, that we shall have enough to guard against Hazards of Weather, &c. and perhaps to oblige a Neighbour.

We must also allot Half a Rod of Ground, in some By-place, for a Plantation of Horseradish, and another Half Rod for a Plantation of Skerrets and Eschalots.

Ground for Pot-Herbs, four Rods.

The next Parcel of Ground must be appointed for twelve Beds of Pot-Herbs, which (allowing five Foot and a Half for the breadth of each Bed and Ally) will take up four Rods of Ground, and should be planted thus, *viz.* Two Beds of Minth, one of Red Sage, one of Sage of Virtue, one of Pennyroyal, one of Hyssop, one of Winter-Savory, one of Sweet-Marjoram, one of Burnet, one of Clary, one of Thyme, and one of Parsley. I omit to mention Borage, Rosemary, Angelica, and Lavender for these Beds, because Borage will certainly find some Place or other among the other Crops, and Rosemary will do well in By-places well expos'd, as Angelica will fill some of the most shady Corners; and for Lavender, it well do best in an Edging; and one may likewise have Edgings of Sorrel and of Parsley; for we should sow Parsley twice every Year, and especially a good Crop against Winter. When a large Bed will afford but little, we may sow a Line of Marigolds in a spare or vacant Place, rather
than

than make a Bed on purpose, because they do not last. I have allow'd full Ground enough in the above Articles, and besides, as all Men are not of the same Taste, perhaps some of the Herbs I mention may not be thought useful; if they are not, the Ground may be planted or sown with other Things. But it is very necessary however to plant our Pot-Herb Garden as near the Kitchen as possible.

Ground for Asparagus, three Rods.

We come in the next place to provide such a Crop of Asparagus as may sufficiently supply a Family of seven, to have a good Quantity every Day, from *April*, that they begin to come up, till *June*, that we must leave off cutting them. I reckon that little more than three Rods of Ground is sufficient; that is, to have four Beds of Thirty three Foot long each, and the breadth of each Bed four Foot, and the Allies two Foot. These Beds, when they are full cropt, will afford us about Seven or Eight Hundred of Asparagus in a Week, which, I suppose, will be enough for such a Family as I mention; and they will last good about nine Weeks. The Method of preparing and planting these Beds may be seen in my *New Improvements of Planting and Gardening*, and also some Particulars relating to them, in another Part of this *General Treatise*. However, the Plants must be set about ten Inches apart, and be Plants of one Year old.

But, besides these Beds of Asparagus for the Spring Season, I allow three Rods of Ground, for Seminaries and Plantations of Asparagus, for the Use of Hot-Beds about *Christmas*, or in
the

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the Winter-Months : I have directed their Management in the above-mention'd Book.

The first Year of planting the Asparagus-Beds, we are to sow the whole Piece with Onions, which will afford enough for a Family of Six for one Year ; for we should not open the Alleys till Winter, and then the Earth taken out of them must be flung upon the Beds.

If these Beds lie all together, they should run North and South, because we should set a Row of forward Beans in each Alley every Winter. We must note also, that the first Year, by sowing Onions upon these Beds, we shall have three Rods of Ground to spare in the other Part of the Garden.

Another Standing Crop is our Artichokes, for which I allow two Rods of Ground, wherein the Lines are to be three Foot asunder, and the Plants in each Line to stand about two Foot apart ; so that in such a Spot of Ground we shall have about One Hundred Plants ; out of which we may expect as many good Flowers, and about half as many indifferent good ones, besides small ones, which are excellent fry'd, or eaten raw with Pepper and Salt. Between these Rows of Artichoke-Plants, we may in the Spring have a Crop of Spinach and Radishes.

In the next place we are to allow two Rods for Raspberries, which should be planted in single Lines rather than in Beds : The Lines should be four Foot asunder, and the Plants in each Line a Foot apart ; so they will bear better, and bring larger Fruit. The Lines of Raspberries, at four Foot distance, and a Rod in length, will be ten in Number ; and between these Lines we may have eight of Coleworts, for the Spring Service, when Greens are scarce,

K

which

which is chiefly occasion'd by the turning up our Ground in *February* for a fresh Crop. But I come now to speak of Crops which are of short Duration, and must be renew'd every Year, and even some of them twice and three times in a Year, or at least to be so planted, as to follow one another in different Seasons. I shall begin with the Bean.

Ground for Beans.

Besides what we have mention'd of Beans to be planted in the Asparagus Alleys, we must at least allot four Rods more of Ground for Family Use; that is, three of them to be planted for Summer Crops, with the broad *Windsor-Bean*, so as to make two distinct Crops; the other Rod, as well as those planted among the Asparagus, must be for early Spring Crops of the *Hoispar* or *Spanish Bean*: And of these, besides what I have said of the planting them, and cutting them down, to vary the Times of their Ripening, we may still gain a late Crop from them, if we cut down a Parcel of them after all the Beans are gather'd, they will spring from the Root afresh, and bring us a middling Crop late in the Year.

Among my Enquiries this Year I have examin'd into the Quantity of broad Beans that a Rod of Ground will produce, planted with double Lines a Foot asunder, and the distance of two Foot between the double Lines. The Bean Plants are suppos'd to be six Inches apart.

In a Rod of Ground, at this Rate, will be seven double Lines or fourteen Rows of Beans; each Row of Beans will contain about thirty four Plants, and a double Row sixty eight Plants,

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Plants, which in a Rod amounts to four hundred and seventy six Plants.

I have observ'd several Parcels of Beans this Year, of the Broad or *Windsor* Kind, and I find that they are very inconstant in their Bearing, some Plants bringing five and twenty Cods, others eight or nine only: So that, were I to make a moderate Computation, one would suppose every Plant could hardly bear less than ten Cods, reckoning one with another; and in some of these Cods it is not very rare to find three Beans, tho' more generally two, but for the most part but one Bean in a Cod: However, to judge as low as possible, I shall only reckon that a Plant will bring ten pure Beans clear of the Cods, tho' I have number'd above twenty Blossoms upon a Plant.

In the Measure of the Broad Beans, when they are taken out of the Cods, I find that Fifty Beans fill a *Winchester* Pint Strike-Measure; so that then we may expect from a Rod thus planted, about forty seven Quarts of Beans Strike-Measure, or somewhat less than ten Gallons Heapt-Measure. We may remark, that if we were to set the Beans nearer together, they would bear less Fruit: However, at the Rate I set down, we may suppose that three Rods will produce about thirty Gallons of Broad Beans, clear of their Shells; but this must be while they are fit for eating, for when they dry, they will lose above two third parts of their Measure; that is, a *Winchester* Pint, Strike-Measure, will hold about One hundred and fifty Beans, so that a Rod will take about three Pints of dry Beans to plant it.

The *Spanish* Bean is of a much smaller Kind than the former, but is a great Bearer, so as

to bring, on every Plant, twice the Number of Beans generally found on the *Windsor* Kind. One of the *Spanish* Beans is about one third Part as big as a *Windsor*-Bean; so that I compute, that a Rod of the *Spanish*-Bean, will yield about six Gallons, or about two third Parts as much in Measure, as a Rod of Ground planted with *Windsor*-Beans; and those among the *Asparagus*-Beds, will yield as many more, and especially because these Plants have more Air. So we may compute the whole to amount to about twelve Gallons, which will very well afford us good part of sixty Days Diet, besides some Dishes from After-Crops: While we have these in Use, let us spare those Roots and Herbs which will hold good in that Season. The proper Directions for managing these Crops, I have laid down in my *New Improvements*.

Ground for Pease, eight Rods.

I have observed in my Introduction to this Letter, that the Pea requires more Room than any other Thing in a Garden, and have given some Reasons why it does so; therefore I allow in this Garden, eight Rods of Ground for Pease, besides the Advantage we may have of shifting the Pease in the Ground I allow for Carrots, which is three Rods, so as to set an early Crop of Pease upon it; for the Carrots must be taken out of the Ground when they have done growing, and laid by in dry Sand. So then we shall have eleven Rods of Ground for Pease, besides a Row, if we please, close under a South Wall to be stick'd up: Though they will not rise very high, yet they will bear better, and ripen sooner, than if they were to lie upon the Ground.

But

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But suppose we begin with the Carrot-Piece, for an early Crop of Pease; sow the Lines double and the Pease four or five Inches apart, and the Lines about ten Inches asunder to be staked up; but the Alleys between the double Lines, must be about two Foot Wide, so that we may have six double Rows in a Rod, or in three Rods, about eighteen double Rows, or sixteen Foot and a half long. Now were all these Pease to stand the Weather, which is very doubtful, if we put them in before the End of *November*, then there would be about One hundred Plants in a double Row; and a single Plant of this sort will bear, if it be stick'd up, about twenty Cods, which will carry from about five to seven Pease apiece, and those Pease, when they

are about the bigness of the following Letter **O**, will fill a Strike Quarter of a Pint, Wine-Measure, from One hundred Cods; that is a Pint from Four hundred Cods, or a Quart from Eight hundred Cods; so that we must have Forty Plants, to produce a Quart of Pease for the Table; of the Bigness I mention; or if we allow for Hazards, and suppose Fifty Plants to yield a Quart, then a double Row of Plants will yield about two Quarts; and the three Rods of Pease, or the eighteen double Rows, will yield Thirty-six Quarts, or nine Gallons, Strike Wine-Measure: But if we measure them by the heap'd *Winchester*-Quart, and allow for the Loss of those which will grow too old for eating green, we cannot well reckon above five Gallons of clear green Pease for the Use of the Table; so that we may have about a Dozen or Fifteen good Dishes of Pease from this Parcel.

The other Ground we allot for Pease, which is eight Rods, should be divided into three Parcels, viz. Three Rods for the Sugar-Pea, to be sown in *February*, after the manner of the former, which will follow the earliest Crop in ripening, and yield about five Gallons of clear Pease, *Winchester-Measure*, besides several Quarts for Seed or Winter Use; though it is customary to sow them in single Rows, and then the Alleys between the Lines, must be about two Foot and a half asunder.

We are next to sow three Rods of large Pease, such as the *Spanish-Mooretto*, or the *Rouneval* or *Dutch Admirals*. These must be planted in double Rows in *April*, the Lines of Pease to be a Foot apart, and we must allow half a Foot on the outside of every double Line, to place our Stakes, which Stakes must be bushy, such as the Boughs which are generally cut for Bavin, called *Brush-Wood*. The Stakes ought to be full seven Foot long, so that they be allow'd above half a Foot to be in the Ground, and and that the two Lines be tyed together on the Top, so as to be full six Foot high. The Figure of this Staking, at the Ends of every double Row, will almost represent the Letter [V] revers'd, and every double Row of Stakes will measure near two Foot at the Bottom. Between every two double Rows of Stakes, we must leave a Passage of four Foot wide, so that then there will be about six Foot from the Outside of the first double Row, to the second double Row. So in three Rods we may have five double Rows of these Pease about Thirty-three Foot long each. By this means, if they are staked early enough, and water'd in a dry Time, and, above all, carefully gather'd, or as I used

to direct, *i.e.* To cut-off the Pease with Scissars; after this manner, they will last bearing a long Time, and produce near twice as many Pease, as those that are order'd the common Way. About fifty Cods will yield of clear Pease, as many as will fill a Quarter of a Pint, Strike Wine-Measure; or Four hundred Cods will yield a good Wine-Quatt; and a Plant preserv'd in Health, will bear about thirty Cods: But supposing them to bear only twenty Cods apiece, then a double Row of Thirty-three Foot long, allowing the Pease to stand at least six Inches apart, will yield, when they are taken out of the Shells or Cods, about seven or eight Quarts, and the whole about Thirty-five Quarts, or somewhat more than nine Gallons, Strike Wine-Measure, or for eating Green, about six Gallons, *Winchester* Measure.

There remain yet two Rods to be sown with the same sort of Pea in *May*, for a late Crop, which will afford us above four Gallons of clear Pease, *Winchester*-Measure: So that the Produce of eleven Rods of Pease, thus order'd, will be about Twenty one Gallons of clear green Pease for eating, besides a good Quantity for Seed. Such a Quantity may serve to afford us at least fifty large Messes, to be gather'd between *May* and the End of *September*; and if there should be more than we can dispense with while they are Green, we may use them dry in the Winter, for boiling; and the *Rounceval* Pea, especially is extremely good. It would be well to plant one Rod of this Piece, with the sort of Pea which is common in *Holland*, call'd the *Gourmand*, or Glutton-Pea, which the People eat Shells and all, as we do Kidney-Beans.

Ground for 'Kidney-Beans', two Rods.

Though I allow but two Rods of Ground for Kidney-Beans, we are to understand, that they will afford as much profitable Fruit, as four Rods of Broad-Beans, for in these there is no Waste; and from the Time of the first Crop's beginning to bear, about the Middle of *June*, they continue good 'till the End of *September*, with a little Care.

In setting of these, the Lines should be single, and about three Foot distant from each other, whether they run up Sticks, or if they are of the new Dwarf sort, which does not climb at all; for they will spread more than a Foot and a half; and therefore, should be set about six or eight Inches asunder in the Lines, and have Liberty to spread in the Alleys: Besides, Room must be left sufficient to walk between the Rows. We may set a Rod of each Sort, one in *April*, and the other in *May*, especially the climbing Sort, the latest of the two; for the Dwarf-sort is the most hardy, and bears very plentifully. If they are well managed, we may reasonably expect from the two Rods, above three Bushels of Beans fit for eating; and they will be an agreeable Change among the Summer-Crops.

Ground for Colly-Flowers, two Rods.

I allow two Rods of Ground for Colly-Flowers, which we must plant about three Foot asunder, that they may spread their Leaves, and bring large Flowers, which they will not do, if they stand close together: So in the two Rods to be planted three Foot asunder, we shall have
about

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about sixty Plants, or about ten every Week, while they last. The Method of managing them for the Spring and Autumn Crops, is in my *Kalendar*. Note, These two Rods are for the Spring Crop, to serve part of *May* and *June*; and when they are off, the same Ground may serve to plant out our Sellery for Blanching. The Rows for Sellery must be better than two Foot apart, and the Plants six Inches asunder: From whence we may draw Sellery from *August* 'till *February*. Or if we think that this Spot of Sellery will be too much, plant part of it with Endive for Blanching; but if we use it stew'd at the Table, or in Soup, we must find some other Spot to plant more of it; for these Ways of using it, destroy a great deal.

Ground for Cabbages and Brocoli, five Rods.

I reckon there cannot well be less than three Rods of Ground employ'd for Cabbages, and especially if we have a little Warren of that sort mention'd in my former Remarks. The Cabbage-Plants standing at two Foot Distance, will give us about twenty Rows of sixteen Foot and a half long, or One hundred and eighty Plants; which, besides the regular Cabbages they will produce, will furnish us with a large Store of young Sprouts, even exceeding the Cabbages themselves in Goodness.

I also allow two Rods of Ground for Brocoli, which being planted at about a Foot Distance from one another, this Spot of Ground will carry about Two hundred and fifty Plants, whose Business being chiefly to sprout, the Plants do not require to stand at so great Distance as the Cabbages. 'Tis the Flower-Stalks of this Brocoli
that

that are used at the Table. They must be taken just when they are shooting to Blossom, and the outer Coat or Skin of them pil'd off; they boyl in about three or four Minutes, and eat as well as Asparagus.

Ground for Savoys, or Savoy Cabbages, two Rods.

Though we are provided with three Rods of Cabbages, we may yet allow two Rods of Ground for Savoys; which in the Winter, and towards the Spring, will afford us a very agreeable Variety. These must be planted at the same Distance as Cabbages, and then the two Rods will bear about One hundred and twenty Plants, the Of-fal of which will help to feed our Warren. When we plant our Ground for Cabbages and Savoys, we might sow it with Spinach and Radishes, which would be fit for the Table, before the Plants began to spread.

Ground for Carrots, three Rods.

Such a Piece of Ground will afford us a large Quantity of Roots, either to be drawn in the Summer, or for Winter-Use, and in them there is no Waste; for what we can spare, the Hogs will eat, and the green Tops will be of Service to the Rabbits. So that in one shape or other, they will all come to the Table. These, if they stand at a right Distance, will be in Number about Four hundred upon a Rod, or about One thousand Two hundred upon three Rods of Ground. Besides we may sow with them some Sorts of Cabbage-Lettuce, which will be fit to eat before the Carrots begin to grow large. *Note,* Cabbage-Lettuce will boyl very well. Upon this

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this Piece of Ground, when the Carrots are off, it is, that I have propos'd sowing our early Crop of Pease, or if we were to suppose this Piece of Carrots to bring only a Thousand Roots, they will last a Family of six or seven very well for six Months, to be dress'd every Day.

Ground for Parsnips, two Rods.

This Ground must be sown when we sow our Carrots; but the Root must not be taken up 'till November, and then be laid in the House. We may have about Six hundred Roots in the two Rods, if the Seed be good; and if they are more than we can use in the Kitchen, our Swine will feed extremely well upon them. These are for our Use in the Winter and Spring, and, if managed according to my Directions in my *New Improvements*, will last good 'till June.

Ground for Potatoes, three Rods.

Three Rods of Ground, well planted with Potatoes, will yield us about six Bushels of Roots; but we must not expect any other Crop upon it while the Potatoes are growing. Such Land as is esteemed the worst, will do well for these Roots: And considering how much Profit they bring to a Family, I wonder they are not more generally propagated in the poorer Parts of our Country.

Ground for Onions, three Rods.

These three Rods may be employ'd the first Year of making our Garden, for a Crop of Pease for Seed, or for boiling in the Winter; for the first Year, we shall have a sufficient Quantity of
Onions

Onions upon our Asparagus Beds. This Piece being employ'd for Pease, will yield in a Summer about five Gallons of clear Pease, after they are thresh'd; and when it is used for Onions, it will bring about three Bushels in a Summer. But in this, as in other Parcels of Ground, which I have mark'd, we must observe, That every Crop we sow in it, be of a different Tribe from what has been before, and so shift the Crops on each Spot of Ground every Year.

Ground for Turneps, Summer-Crop, two Rods.

I allow two Rods of Ground for Summer Crop of Turnips; for though our Garden will be well stored in Summer with many Varieties, we should by no means be without some Turnips, to change now and then with our other Garden-Dishes. They will, moreover, be of good Help to our Warren, and their Offals will likewise assist to feed our Swine, so that nothing will be lost. These Turnips will stand at about the same Distance as the Parsnips; so that in the two Rods, we may reckon about Five or Six hundred Roots. When the Turnips are off, this Piece may be sown with Spinach for Winter.

Let us now see what Profit we may expect from our sixty Rods of Ground, full cropt, as I have directed. The Account is as follows.

TABLE

T A B L E

O F T H E

P R O F I T S

A R I S I N G

From the aforementioned Sixty Rods of Ground, planted as aforesaid.

| Number of Rods of Ground. | Profits of the said Rods of Ground. |
|---|--|
| <p style="text-align: center;">A</p> <p>4 Rods for the Hot-Bed Quarter, will carry four Frames, and three Ridges; two of which should be for Melons, and one for Cucumbers. The Produce of these will be also Annual Flowers, Sellery, and Colly-flower Plants, &c.</p> | <p>Melons in one Frame, about — } 10</p> |
| | <p>Melons on the two Ridges, or sixteen Holes — } 60</p> |
| | <p>In all Melons — 70</p> |
| | <p>Cucumbers in two forward Frames, about — } 60</p> |
| | <p>Second Crop of Cucumbers upon one Ridge of eight Holes, reckoning twenty Fruit on each Hole, which is a very small Number — } 160</p> |
| <p>4 Rods carry'd over,</p> | <p>In all Cucumbers — 220</p> |
| | <p>4 Rods 3</p> |

4 Rods brought over.

B

2 Rods are allow'd
for Pickling Cu-
cumbers, set in
Holes four Foot
asunder, or in
Lines to run up
Stakes, may con-
tain about thirty
two Holes, or
thirteen Lines of
Plants; besides
Cabbage-Lettuce
and Radishes, that
will soon be off

Cucumbers thirty
on each Hole, will
amount to in this } 960
Piece.

We may safely rec-
kon One Thousand, if
they are well mana-
ged.

C

3 Rods of Ground
for young Salads,
pricking out of
Plants, besides
Fennel, Dill, and
Rocambole -

Young Salads of
Cresses, Chervil,
young Radish, young
Turnip, or Rape,
young Mustard, or
young Lettuce, Ta-
ragon, Purslane, Na-
sturtium Indicum;
and in the Winter,
brown *Dutch* Let-
tuce, half Cabbaged.
From hence, and the
other double-cropt
Parts, we may ga-
ther a Salad every
Day in the Year.
Salads: —

365

9 Rods carry'd over.

9 Rods brought over.

D

- 1 Rod for Horfe-Radish, Skerrets, and Eschalots

Half a Rod of Horfe-Radish, will afford Roots about 150

Quarter of a Rod of Skerrets will contain Plants about 150, and 'tis common to have three and four Roots on each Plant, so we may reckon 400

Another Quarter planted with Eschalots, will produce about Pounds weight 12

E

- 4 Rods of Ground for Pot-Herbs, will produce —

Mint, Sage, Pennyroyal, Hyssop, Winter Savory, Sweet Marjoram, Burnet, Clary, Parsley, Thyme, Sorrel, Rosemary, Burage, Angelica, Lavender, Baum; some sort or other to be gather'd every Day in the Year. Parcels 365

F

- 3 Rods of Asparagus in full Crop, will produce —

Asparagus, after the Rate of 700 per Week, and lasting good for nine Weeks, will bring about, Hundreds 60

Or the first Year about two Bushels of Onions, if they are healthful.

17 Rods carry'd over. Hun. of Aspar. carry'd over, 60

17 Rods

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17 Rods bro^t over. Hun. of Asparag. bro^t over, 60

| | | |
|---|---|---|
| F | 2 Rods of Asparagus for Hot-Bed Use, will produce — | <div style="display: inline-block; vertical-align: middle;"> One Hot-Bed, which may be planted with one Rod of Roots, full Crop, will produce about Hundreds — — </div> <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin: 0 10px;">}</div> <div style="display: inline-block; vertical-align: middle;">8</div> |
|---|---|---|

| | | |
|---|--|---|
| G | Hund. of Aspar. in all, 68 Or Buds, in No ^o — 6800 | <div style="display: inline-block; vertical-align: middle; font-size: 3em;">{</div> |
|---|--|---|

| | |
|--|--|
| 2 Rpd ^s for Artichokes, will produce, <i>besides Spinach and Radishes in the Spring</i> — | <div style="display: inline-block; vertical-align: middle;"> Of good Flowers or Heads, about — </div> <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin: 0 10px;">}</div> <div style="display: inline-block; vertical-align: middle;">150</div> |
| | <div style="display: inline-block; vertical-align: middle;"> And of Suckers or small Flowers, about — </div> <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin: 0 10px;">}</div> <div style="display: inline-block; vertical-align: middle;">150</div> |

| | | |
|---|--|--|
| H | 2 Rods of Raspberries planted in ten Rows, will produce, <i>besides Colewort Plants, &c.</i> | <div style="display: inline-block; vertical-align: middle;"> From the ten Rows of Raspberry Plants, we may gather about Gallons — </div> <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin: 0 10px;">}</div> <div style="display: inline-block; vertical-align: middle;">5</div> |
|---|--|--|

Changeable Crops.

| | | |
|---|---|--|
| I | 4 Rods for Beans are principally set aside for Summer Use — — | <div style="display: inline-block; vertical-align: middle;"> From three Rods of Broad Beans, if they are set wide enough asunder, we may expect of Beans, clear of the Shells, Gallons — — </div> <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin: 0 10px;">}</div> <div style="display: inline-block; vertical-align: middle;">30</div> |
|---|---|--|

| | |
|--|--|
| | <div style="display: inline-block; vertical-align: middle;"> From one Rod of Spanish Beans, clear of their Shells — </div> <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin: 0 10px;">}</div> <div style="display: inline-block; vertical-align: middle;">6</div> |
|--|--|

| | |
|--|--|
| | <div style="display: inline-block; vertical-align: middle;"> To which we may add the like Quantity of Spanish Beans, from the Asparagus Quarter — — </div> <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin: 0 10px;">}</div> <div style="display: inline-block; vertical-align: middle;">6</div> |
|--|--|

In all, we have Gallons, 42

| | |
|-----------------------|---------|
| 27 Rods carry'd over. | 27 Rods |
|-----------------------|---------|

27 Rods brought over.

| | |
|--|---|
| | <p>Three Rods of the Sugar Pea, will yield of Pease clear of the Shells, about Gallons — — } 5</p> |
| <p>K</p> | <p>Three Rods of Rouncevals, or Dutch Admiral Pease, will yield of Pease clear of the Shells, about Gallons — — } 7</p> |
| <p>8 Rods of Ground for Pease, principally set apart for that Use in Summer: As also of Pease sown upon the Carrot-Quarter — —</p> | <p>Two Rods Spanish Mooretto, clear of the Shells, will yield Gallons — — } 4</p> <p>To these we may add the Produce of three Rods of early Pease, sown upon the Carrot-Quarter, which will yield about Gallons — — } 5</p> |
| | <p>In all the Measure of Pease, clear of the Shells, will be about Gallons Winchester Measure — — } 21</p> |
| <p>L</p> <p>2 Rods for Kidney Beans — —</p> | <p>The Produce of two Rods of Kidney Beans, will be about Bushels — — } 4</p> |
| <p>37 Rods carry'd over.</p> | |

L

37 Rods

37 Rods brought over.

This Piece will afford us about Sixty good Colliflowers in May and June — } 60
Flowers — — }

M

2 Rods are allow'd for Colly-flowers, for the Use of the Spring, and the same Ground to be afterwards trench'd for blanching of Sellery

The blanch'd Sellery, which may grow upon two Rods, will afford in Plants about — — } 450

Which may serve for one hundred Salads, or if used in Soups, or Stew'd, will not last above thirty Days; for a dozen Plants will make but a little Shew at the Table in those Drefes — — }

N

3 Rods for Cabbages

The three Rods for Cabbages, will afford us about — } 180
Heads — — }

The Sprouts of the same will amount in Quantity to about as much as the Neat Cabbages: So that to reckon them as Cabbages — — } 180

Then in all, besides the Offals for Rabbits, there will be to the Quantity of — } 360

42 Rods carry'd over.

42 Rods brot over.

2 Rods for Brocoli
Plants —

Two Rods of Brocoli will contain Two Hundred and Fifty Plants, from whence, when they are in their sprouting Perfection, we may gather about eight or ten Sprouts apiece, as big as Asparagus: The best is to take them when their Sprouts are pointed with the Flower Buds a little before they would blossom. So we may gather about Sprouts —

2000

We may reasonably expect from these two Rods, of good Heads, about —

120

P
2 Rods for Savoy
Cabbages —

But as these come towards Winter, their Sprouts will be but few: However, their Goodness makes amends. We shall reckon the Sprouts of these equal to Fifty full Heads —

50

In all —

170

46 Rods carry'd over.

L 2

46 Rods

46 Rods brot over.

3 Rods for Carrots { I compute that this
Piece will bring of
good Carrots about } 1000

R { On this Piece of
2 Rods for Parsnips { Parsnips we may expect
Roots about } 600
Five or — —

S { These three Rods
3 Rods for Potatoes { of Ground will yield
us, of good Potatoe - Roots, about } 6
Bushels — —

T {
3 Rods must be
allow'd for Onions after the
first Year; but
as the first Year
we shall have a
Crop of Onions
upon the Asparagus Beds, we
shall, during that
time, sow it with
Pease for Winter
boiling — }
These three Rods
will bring us of clear
Pease, after Thrashing, about Gallons } 5

V {
3 Rods for a Summer Crop of
Turnips — { This Piece of
Ground for Turnips
will contain of Roots
about Five or — } 600

60 Rods the Total.

Having

Having taken a View of the principal Crops to be rais'd in this Parcel of Ground, we must observe, That as soon as any of them are off about *July*, we must then provide for the Winter; such as Carrots, Spinach, and such others as we may chiefly desire: And if we should happen to have more Ground vacant than we could well crop at this Season, it should be trench'd up, to lie open the Winter, for Spring-Service.

From hence we may observe how a Piece of Ground, of Sixty Rods, may be dispos'd for a Kitchen-Garden, and what will be the Produce of it, if the foregoing Directions are exactly follow'd. I have likewise endeavour'd, in the parcelling it, to set down the Quantity of every sort, either of Herb or Root, which may be produc'd upon each Parcel appointed; but I desire you will have this Regard to a Calculation of this Nature, that bad Seed, or bad Seasons, may sometimes bring you short of your Expectations; and when I suppose a Number of Roots upon a Rod of Ground, they may not all perhaps be fit to bring to the Table. And again, we must observe, that every particular Gentleman has a Taste to himself, which may make him desire either more or less of each sort of Herb, than I have appointed. It will then be necessary for him to consider well of what he likes best, before the Work is undertaken, and from these Tables to collect what Quantity he may reasonably expect or desire from this or that Proportion of Ground, and then judge how to parcel his Garden, so as to reap his Desire from thence; for, I suppose, one great Reason why so many complain of their Gardens and Gardeners, is the want of

this Consideration, and of giving their Gardeners a List of what Things they most delight in; for without such Instructions it is the Business of a Gardener, when he has a Ground under his Care, to have something of every sort, and perhaps those Things which he has happen'd to cultivate in the greatest Quantities, may prove the least acceptable to the Master, and then so much Ground is, in effect, lost to the Owner; or if there should happen to be the largest Share of the Ground cultivated agreeable to the Owner's Desire, yet whatever is not so, is sometimes esteem'd as so much Loss, unless we allow such a Parcel of Land for the Entertainment of those of our Acquaintance, who differ from us in their Taste of Garden-produce.

But let us consider a little further of this Matter, with Regard to the Number in Family, who are to partake of the Product of our Garden, and besides the singular Taste of the Owner, which must be first regarded, let those Things be cultivated which are useful in the Family-diet; for whoever has seen the Fruiterers Bills for Herbage and Roots to Families, which are pretty numerous, will find that a Garden does not a little contribute to save in the Expence of House-keeping: It is not very rare to see Bills from Fruiterers and Herb-shops, of one Winter's standing, to amount to Sixty, Eighty, an Hundred, and sometimes an Hundred and Fifty Pounds, where the Families are large; and then let us judge whether that Article is not worth Consideration, or whether a Garden of our own, well-order'd, will not be advantagious to us: And besides the Crop we have in the Winter, our Summer Crop is still much more profitable. This

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This Calculation you will see, exactly fits your sixty Rods of Ground, in which I have introduc'd as many Sorts of Things as I thought Necessary and Useful; and I think, as I have dispos'd it, there will hardly be a want of any Herb or Plant throughout the whole Year, even tho' you do not declare your particular Fancy till after all is plant-ed; for otherwise, as I hinted before, such a Spot of Ground adapted to the Mind or Custom of a Family, so that it should contain only some particular things; such a Ground, I say, might be made to supply ten or twelve in Family, Pease excepted, provided it is not shaded with Standard Trees, for when those are found in such a Piece of Ground as this, altho' they are not planted very close together, yet such Herbs, Plants, or Roots, as are under or near their Shade, never thrive or come to good, tho' the Seeds were of the best kind.

The Reason why I except against common Pease in such a Piece of Ground, when it is to furnish ten or twelve in Family, is, because they, in the first Place, take up more Room than any Plant belonging to the Kitchen Garden; and, in the next Place, a Crop of common Pease, when it becomes fit for the Table, soon grows beyond the Table use; they grow old presently, and become fit for nothing but to save for Seed. Indeed some of the *Spanish Marettto* or *Roumevals*, will bring good Crops, and last a long time, with good Management; or we may set some of the smallest Dwarf-Pease, so as to bring their Crops at different times from those planted in the Neighbourhood.

From what has here been said, I suppose, it will be not difficult for any one to judge of the Product of any Quantity of Ground, and to direct

how much of each sort of Herb, Plant, or Root, should be raised in a Year for the Use of a Family of six, of ten, twenty, or any greater Number of Persons: And besides, we may yet expect no small Benefit from some Fruits which may be trained in Espaliers, and from Gooseberries and Currans, which may be planted in proper Places in the same Garden; but we must always have a Regard to place such Plants at good Distance from one another, so as to have the Air and Sun free and open where we raise any of the Herbs or Roots which we sow annually, otherwise they will run upright, and never Set to any Substance.

I cannot well conclude this Letter, without putting you in Mind, that in *August* and *September* it will be a proper Time for you to examine the Fields for Mushrooms: In order to provide yourself with that sort of Earth which is found about their Roots, and is full of fine white Threads, and sometimes has little white Knots appearing here and there in it; for this Earth contains what is necessary for the Production of Mushrooms. The Mushroom is so great a Curiosity, and is so useful a Plant in a Garden, that I cannot help giving you the following Account of the Method of making the Beds for them.

Of Mushrooms, the manner of their artificial Production.

NOtwithstanding the Value which is set upon the Champignon or Mushroom, by Men of polite Taste, and the extraordinary Price which those of the best Sort will bring in the Market; I have not been able to persuade any of our Market Gardeners, to make that Branch of Gardening their Study or Practice; nay, even tho' they have

have been invited to it by Persons of Honour, who would take all off their Hands that they could raise. In the Autumn Season indeed, it is common to see them appear naturally upon old hot Beds that have been ill made; and then it is almost as frequent, that we are told those Beds were made on purpose to produce them; but these Beds are inconstant, giving a few for a short Space, and leave us the greatest Part of the Year without them; whereas, if the Beds are rightly dispos'd and order'd according to Art, we may have them at Pleasure in any Season.

I have already observ'd in some of my former Works, that the *French Way* of making Mushroom Beds, (I mean the Method which is us'd about *Paris*, where we may continually find several Acres of these Beds) is to make each Bed at twice, and that we must only use pure Stone-Horse Dung; each Parcel to be toss'd up fifteen Days in a dry Place before we use it, and kept during that Time free from Wet; which must unavoidably be observ'd, or we cannot hope for good Success, and there seems to be good Reason for it; for by this making of the Bed at twice, the Bed partakes of two different Heats at the same Time; the first Part by that time it has been made fifteen Days, begins to decline in its Heat, and then the fresh Dung coming to be laid upon it, increases in its Heat as the first Part declines, which affords us much such another changeable Variety as we find in the Season, when Mushrooms appear of their own Accord; and it is such Irregularity of Season, that gives Life to the Seed or Spawn of the Mushroom already in the Ground. It is to be observ'd likewise, that when the Bed is quite made, we must not cover it above an Inch thick with fine Earth; for if it is more than that thickness, and the Mush-

rooms

rooms chance to come up, they will be small and watery, especially, if the Earth be somewhat stiff; indeed if the Earth be extream Light and open, though it be laid a small matter thicker than an Inch, it will not do much Harm.

I have observ'd that the *French* Gardeniers, when they make Beds every Month, put Pieces of the Mushroom Earth, as large as Walnuts into the Earth which covers the Bed, just in the Line where the two Makings of the Bed joyn; for 'tis in such a Place where the Mushroom Earth, *i. e.* that which is full of the little white Strings and Bulbs of the Mushrooms, meet with the declining and encreasing Heat, which is so necessary to make them spread and grow; and moreover, the Horse Litter which covers the Bed, contributes to retain the Vapour which rises from the Bed, and imitates in some Measure, what we call a Fog; and besides, only admits a glimmering Sun to reach the young Buttons of the Mushrooms; for too much Sun dries the young Mushrooms, and stops their Growth, and too little, suffers them to rot; therefore it is necessary the Litter we cover our Bed with, should be clear'd from all Dung, and be laid upon the Bed very light and free. I am the more particular in these Observations, because some Beds have been made for the Production of Mushrooms after my Directions, as has been said, that wanted every one of the Particulars I have here reason'd upon; and at last when it was found that no Mushrooms appear'd, the Fault was laid at my Door. But besides these Errors of making the Beds at once, and with old Dung; when I came to see them, they were made flat at Top, which is a Position that a Mushroom does not like, it holds the Water too much, and they become rotten thereby;

thereby ; but upon the Side of a Slope, as in the Bed I direct, is the Situation they delight in. We ought also in two or three Days after we have planted our Bed with Mushroom Earth, to be very careful to examine it Day after Day ; for if a Mushroom should come up, and rot upon the Ground, it will breed Maggots or Worms, that will destroy all the young Spawn or Buttons in the Ground, and then our Labour is all lost ; and besides, this Examining our Beds every Day, will keep the Litter light and open upon the Beds, and so promote the Mushroom Growth.

To examine the Course of the Mushroom Fibres, we shall find at proper Distances, Knots or Knobs joyning to the Strings of the Roots, each Knot about the Bigness of a Pin's Head, running just under the Surface, in the Manner of Potatoe Roots ; which Knots in a few Days, if the Bed has any Heat, will come to be Mushrooms fit to gather ; and we must by no Means let any of them remain upon the Bed after they begin to spread, or open their Caps, for then they will breed Worms that will destroy all the young ones ; so in the gathering them, we must have no less Care to take all the broken Parts of the Mushrooms away, and particularly every broken Stalk, for they first are attack'd by the Worm ; so likewise when we gather them, or pull them out of the Ground, if we find any small spawn about the Roots, we are to separate it from the Root, and plant it immediately in some Part of the Bed where there are the fewest Mushrooms, using this Spawn very gently, so as not to bruise it ; and in a few Days, in proportion to the Heat of the Bed, it will grow and produce Mushrooms.

When

When we plant any of the Mushroom Earth about Autumn upon old decay'd Beds, I find it will be about ten or fifteen Days before they appear; but when we find once that the Roots spread, and begin to be full of Knots, then we may break off some Pieces of that Earth, and plant them at a Foot Distance; and by such Means, in a little Time, the whole Bed will be cover'd with them; after this Manner from one Single Root, I have in about fifteen Days Time had a whole Bed full, tho' the Bed was quite without Heat; but then it was at a Season when they came up naturally, but when that is not, we cannot hope for good Success in planting them, without such an hot Bed as I have directed.

From what I have here mention'd, it appears that the Mushroom increases by the Root, and may be transplanted as well as another Plant; but whether it has Seed or not, is yet a Query: But that the Directions I have given concerning the Manner of these Beds, may still be better understood, I have prevail'd upon the ingenious Mr. Fairchild of Hoxton, to make one which is now well furnish'd with Mushrooms; Mr. Benj. Whitmil, Gardener, near the same Place, has made another, which has the like Success. Before I conclude, I think it not improper to give you the following Account concerning an Improvement of the Cabbage-Plant.

An Account of the Manner of making Cabbages, or of blanching Coleworts.

Since the blanching of Herbs has been commonly practis'd in *Britain* for many Years; it is to be wonder'd that no Method has yet been taken-

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taken among our famous Gardeners, to accelerate the ripening or whitening of Cabbages, especially, since those which come forward, are known to be so profitable in the Markets, that one single Cabbage will bring as much Money, as four or five which come late in the Year.

Mr. *Keys* of *Tutbil-Fields* tells me, that it has been a Practice for many Years in some private Gardens about *Worcestershire*, *Staffordshire*, &c. to fold up the Leaves of Coleworts or strong Cabbage Plants, and to tie them together; by which Means, in a Fortnight's Time, the inner Parts will become white, and eat as well as any Cabbage; he has practised this in his own Garden with so good Success, that from him at last, most of the Gardeners about the Neat Houses, are fallen into that Method, and have reap'd good Sums of Money from it.

In the dry Years, especially, this will turn to extraordinary Account; for then our Plants, tho' they come from the best Seed, will be apt to run, or at best will make but thin and indifferen tHeads, but here there is not aLeaf lost; and however the straggling Leaves of the Plants may be judg'd uselefs before they are ty'd up, they then become exceeding sweet and agreeable by blanching; but in the Practice of this Method, two Things must be carefully regarded.

First, That the Leaves of the Plants we design to tie up, must be very dry; for if there should be any Dew or Moisture upon them, they will rot and mildew, when they come to be shut up from the Air: And, *Secondly*, we must fold each Leaf carefully over one another, in the exact Order they grow, beginning at the Centre, 'till all the Leaves are folded; and then bind them with Bafs cross-ways, from the Top of
the

the Crown to the Stalk, in such a Manner as the Leaves may not burst the Bands, which they will be apt to do about Fortnight after they are ty'd; and indeed we should not do more Plants in this Way at one Time, than we suppose we can use in about ten Days after they are blanch'd, for they will grow unshapely, and lose of their Sweetness: It is to be remark'd, that as soon as we have tied up these Plants, they should be well water'd at the Roots, which will fix the folded Leaves in the Order we have plac'd them, and accelerate their Whitening, which at most will be in a Fortnight. I think too, that by tying up some Colewort Plants in the early Season of the Year, they would eat much better for being blanch'd, but that is according to every one's Palate. I might have mention'd in my Remarks on the dry Summer, that though few Trees were blighted in the Spring by scorching Winds, or small Insects, yet the Herbage was very much annoy'd by the Caterpillar, which severely attack'd the few Cabbages we had, so that even of the few, at least one half were spoil'd.

I am Sir,

Your humble Servant,

R. Bradley.

C H A P.

C H A P. VI.

Observations and Conjectures concerning Sheep, and of Methods to bring them artificially to blossom; so that some Sheep in every Flock, may, in every Month of the Year, produce Lambs; with an Account of the Suckling of Lambs in the House.

THE Observations which I have made concerning Sheep, has given me many Occasions of Reflection in a Philosophical Way, how far they may be improv'd: Their Use is very great in our Nation especially; their Wool is of that Service to us, that one may say, the greatest Part of our People are employ'd or benefited by it; their Flesh is, perhaps, as generally admir'd as any part of the *English* Diet; their Skins, Fat, Bones and Entrails, are all valuable, nor is there scarce one Part lost to the Publick.

We are told that we have now in *England* several kinds of Sheep, which are by some distinguish'd by the Coarseness or the Fineness of their Wool: Some are more abounding in Wool of a coarser sort, and some again are noted for carrying greater or lesser Burdens of either sort of Wool, or in Terms used by the Husbandmen, are of *deeper* or *shallower* Staple. But whether the same Breed of Sheep may not produce a deeper or shallower Staple, or finer or coarser Wool, from the different Food which several Countries afford, I shall consider by and by.

Our

Our Countryman *Markham*, who in some Things proves to be very right in his Thoughts and Observations concerning Cattle, remarkably describes the Difference which we should observe to distinguish between the good and bad kind of Sheep in *England*. He tells us, that if we would chuse such Sheep as will bring a fine Staple of Wool, from whence may be drawn a Thread as fine as Silk, we may find them about *Leominster*, in *Herefordshire*, and in some other Parts of that Country, and also in the Parts of *Worcestershire* adjoining to *Shropshire*; yet these Sheep, he observes, are of very little Bone, black faced, and bear a very little Burden of Wool. The Sheep upon *Cotfall* Hills are of better Bone, Shape and Burden, but their Staple or Wool is coarser and deeper.

The Sheep in the Part of *Worcestershire*, which borders upon *Warwickshire*, and many Parts of *Warwickshire*, all *Leicestershire*, *Buckinghamshire*, and part of *Northamptonshire*, and the part of *Nottinghamshire* likewise, which is exempt from the Forest of *Sherwood*, are large bon'd Sheep, of the best Shape and deepest Staple, chiefly if they are pastured; yet is their Wool coarser than those of *Cotfall*.

The Sheep which are the largest of all, are in the Salt Marshes in *Lincolnshire*, but are not esteemed to be valuable in Wool; for their Legs and Bellies are long and naked, and their Staple is coarser than all the rest.

The Sheep in *Yorkshire*, and the more Northern Parts of *England*, are of reasonable big Bone, but of a Staple rough and hairy.

The *Welsh* Sheep are the least profitable in Wool of any other, but their Mutton is sweet and delicate, their Bodies are small.

From

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From some other curious Observations of a great Author; we might suppose that the Fineness of the *Spanish* Wool depends upon the kind of Sheep in *Spain*; and he proposes for publick Benefit, that we should send to *Spain* for Sheep. But it is beyond all doubt, that *Spain* had their Sheep, which produce the Wool which is so valuable, first from *England*. This Author wonders that our Sheep-Masters have not procured some of those fine *Spanish* wool'd Sheep, supposing that for a Time it would mend our Wool, if not continue so for ever. He hints likewise, that *Dutch* Sheep will ordinarily bring two or three Lambs, and that *Turkey* Sheep are very large with great Tails; but that their Wool is coarse, not only because of their coarse Feeding, but because in hot Countries they often mingle with Goats.

Now from these Observations, and my own upon them, I shall draw some Inferences which may perhaps be serviceable to a judicious Farmer, or such Sheep-Masters especially, who know the Profit of good Wool.

We may gather from the Remarks which have been mention'd, that the Difference between one and the other sort of Sheep, consists in the Largeness and Smallness of their Bodies, the Bigness or Smallness of their Bones, the Roughness or Fineness of their Wool, or whether they bring a greater or lesser Burden; and this we find happens more or less, as the Sheep are fed in some Places, after a different manner than they are in others.

Let us then proceed to examine how Nature acts in other Cases; that is, how it happens that Animals of various Kinds, and Plants of different sorts, are apt, now and then, though

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we still look into those of the same Breed, to be bigger bodied than others; some have longer Hair, and perhaps very fine, others to have shorter, and very strong and hard: How small Silk Worms, though of the same kind, in common with the best, should give us the same length of Silk as the rest, and much finer, and therefore more valuable: How Trees and Plants though of the same Species, should alter so much, as to have their Leaves, Blossoms and Fruit, of more or less luxuriant Growth, even so much as that one of the same sort shall not fill, either in Leaf or Branch, half so much Quantity of Space, or take up so much Room as another, altho' the Figure and Colours in all Parts do not vary. This, I think, depends either upon the Quantity or Quality of the Nourishment every Animal and every Vegetable receives; if it is more, all the Parts are more open'd, distended, and are more coarse or large to the Sight; if the Nourishment is less, the Parts of those Bodies are less fill'd or explain'd, and they must be more minute and fine than the others, which receive full Allowance of Nourishment.

But to come to Proof of this, if there is any Question, we may observe, that the last Egg laid by a Fowl is generally hatch'd in so low a Condition in Point of Magnitude or Strength, to the rest of the same Brood, that such a Chicken never after can arrive at the same Perfection with them; for this last lay'd Egg could not receive the same vigorous Nourishment from the Hen that the first did, nor can I suppose such an Egg could be so powerfully impregnated by the Cock as were the first; therefore the want of prime Strength in both the Male and Female, seems to be the reason why the latter
Egg

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Egg does not produce a Chicken of so big Bone or Parts as the first lay'd Eggs, tho' they were all incubated or set upon at one Time.

And again we must observe, that this Minion-Chicken, as its Parts of the Body are less nourish'd than the rest of the Brood, so the Feathers upon its Body are not so large or luxuriant as those upon the Bodies of the others; for Feathers like Plants are larger or smaller, as the Juices of the Bodies they spring from are more or less abounding in Strength and Nourishment.

Secondly, When I have for Experiment sake hatch'd the Spawn of Fish in earthen Pans, fill'd with Water, and a Coat of Earth at the Bottom of them, I found that the spawn or Fry of every particluar Fish kept together; but that one of the Fry was always less than the rest, and brought up the Reer, which in every Example I have seen was constant; so on the other hand, the Fish of each Fry which led the Shoal, was always bigger than the rest; which I suppose happens for the same Reason I have mention'd concerning the Fowls.

But when I came to compare the young Fish which I had hatch'd in earthen Vessels, with those which were of the same Season, hatch'd in the River, I found that there was more than a Third difference in their Size, those who were Possessors of the River were so much better nourish'd than the Fish I had hatch'd and fed in a narrow Compass.

Upon the Tryal which I have now mention'd, an Acquaintance of mine took a young Fry or Shoal of little Carp, and put them into three Ponds; he finds that in one Pond the Water happens to be so rich and advantagious to them, that they are about half as big again as those

which were put in the other two Ponds, and that there is a remarkable Difference in the Size of the Fish which are in the last two Ponds I have mention'd.

The Pond where the largest Fish are found seems to be advantaged by the washing of a neighbouring Hill, when quick Showers happen.

The other two Ponds are not so well placed as the former, one of them is upon a Clay, the other upon a Gravel, and are nearly of the same Bigness; of these two we find the Fish in the Clay Pond are larger than those in the Gravelly Soil; so that as they have more or less Nourishment in one Pond than another, they are larger or smaller in Proportion, tho' they were all of the same Breed and Age, for the Spawn of one Fish hatches all in one Day, nay within three or four Hours Time.

Thirdly, If we take the Seed of any Plant from one Head or Seed-Pond only, and sow that Seed in three or four several sorts of Soil, some of the Plants which spring from that Seed will be more luxuriant and vigorous than others, according as the several sorts of Land have Salts in them necessary for the Nourishment of the Seed sown in it: I have sown Rye-Grass Seed gather'd from one Stalk or Head in four several Places, and the Increase of Vegetation has been nearly as different, as if I had sown four different sorts of Grass; they are more or less vigorous as they have a greater or lesser Share of Nourishment.

So all Cattle, where they find Grass or other Food which yields them a natural Plenty of Nourishment without Abatement, during the Time of their Growth, have their Parts more
fully

fully explain'd, and are much larger in Bulk than those of the same Breed, which are pinch'd in their Diet, or have Plenty of such Food which is not agreeable to them; for one and the other are equally detrimental to them. And so likewise when Cattle are come to the Extent of their Growth, that we can discern by their Bulk, whether they have fed plentifully or sparingly, we may reasonably suppose that either their Hair or Wool, which are so many Plants growing upon their Bodies, will be more or less sizable: If they are large in Body they have more Juices to supply and nourish their Hair or Wool; and in such case, their Hair or Wool will be stronger or coarser, and their Flesh more spongy or less firm, than what we find in those of the same Race which have fed on shorter or less luxuriant Diet; for I observe, that such Cattle, either Sheep or Kine, which have a short Bite, or are sparingly dieted, have generally, if not always, finer Coats than the former, for the Reason I have given before. But we should observe likewise, that this full or scanty Food must begin from their Birth, and it is this I think that will make them larger or smaller boned, tho' they all come from the same Stock. So the short Bite of Sheep upon some Downs or Heaths, or some Herbs which they find there, may occasion their Bodies to be small, and their Wool fine; as on the contrary, rich Land abounding in high Grass, or the Herbs naturally growing with such Grass, may probably be the Occasion of the large size of Sheep feeding there, and of the Coarseness of the Wool; so likewise do these Kinds of Food bring the Ewes to blossom, or to the Rut sooner or later in the Year: But to use Art with them upon such a Foundation, one

might have breeding Sheep for any Month in the Year ; it has been try'd upon some Creatures which never have been known to couple in our Climate, and has had an immediate Effect upon them.

In some Part of *North Wales* I am assured, that Goats often couple with Sheep, and therefore the Wool is sometimes worse than it is elsewhere in *England*; and Care should be taken, if possible, to prevent it: Nor should we chuse our Rams of such Kinds as have Horns, for their Offspring endanger the Ewes in yeaning. The Dodder Sheep are prefer'd by every Shepherd of Judgment, being good Breeders with little hazard.

Some Observations concerning the Breeding and Suckling of Lambs in the House.

WE are first to remark, that the Ewes which are fed in some Parts where there are invigorating Herbs, go to Rut or Blossom in every Month in the Year, except *April*, *May*, or the Beginning of *June*. These Herbs which are so invigorating and forcing to the Spirits, are more particularly found in dry, than in wet Places; and it is very certain to use them skilfully, would contribute to bring Ewes to rut in *April* and *May*, so that every Month in the Year some of his Sheep may produce Lambs. In the mean Time, I must acquaint him, that whatever Ewes he finds most forward to rut in *December* or *January*, he must keep them from taking the Rams, which every skilful Shepherd knows how to do.

But, however, concerning the Suckling of Lambs, it will be first proper that I explain

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some few Terms which are necessary to be used, and which perhaps may not be understood in every County.

First, Bastard Ewes in *Surry*, are those Ewes which suckle the Lambs of other Ewes, or have lost their own.

Secondly, Bastard Lambs are such Lambs as have lost their Dams, and suck upon other Ewes.

Thirdly, Tod Belly, is when a Lamb is thin belly'd like a Greyhound, or cling'd up.

Fourthly, To suck at Head, is a young Lamb's sucking the first of the Milk.

Now, with regard to the House for Lambs it ought to be divided into Stalls, that every Lamb may be more conveniently suckled; and Care ought to be taken that too many Lambs are not put into one House at one Time, lest they fall distemper'd, and become Set or Tod belly'd; to prevent which, also Care must be taken that what Milk the youngest Lambs leave (if any) may be suck'd by the oldest Lambs.

If you have any Bastard Ewes, suckle the eldest Lambs, beginning about Seven in the Morning, and about Four in the Afternoon; and when the Bastard Ewes have Milk enough to suckle all your Lambs thereon, then put in the Dams only at Noon, and between Nine and Ten at Night, and out again between Nine and Ten in the Morning.

To avoid Mistakes, which might happen in the Suckling of many Lambs, we must mark them to know which has been longest in suck on the Bastard Ewes, and those which have been long at suck, are to suck still at Head.

As soon as possible, let your Ewes Udders and Tails be clip'd from the Wool, to keep

them clean from Dirt they are apt to gather in the House.

When those which suck at Head, on the Bastard Ewes, have had their Meal, put on those Lambs which you design next to suck at Head, to suck those Ewes clean of their Milk.

Observe if you have any Twin Lambs, or Dams that give little Milk, help them on the Bastard Ewes.

Feed your Lambs on Flour, Wheat or white Pease in Troughs, and with Wheat Straw in Racks, and sometimes fine Hay, but Straw is better for the Colour of their Flesh.

Before I conclude, I must take Notice of a Piece of Foreign Husbandry, of good Use where it is practised, which depends upon the Housing of Sheep at Night, and from whence we have taken the Method of folding our Sheep at Nights for the Benefit of Land. In *Flanders* and other Parts of the Continent, where the Sheep are endanger'd by Wolves, they are housed every Evening, in Places spread with clean Sand, about five or six Inches thick; which Sand Floor, being every Night renew'd, occasions the Whole to be taken away about once in a Week, and is so rich, by the Means of the Dung and Urine of the Sheep, that 'tis purchas'd at great Rates, and makes excellent Manure for stubborn Ground.

C H A P. VII.

An Account of a Warren, and its Profits; from Mr. William Gilbert, Master of the famous Warren, now upon Auborne Chase.

AUborne Chase, which of long Date, has been allow'd to produce the best Rabbits in *England*; is situate in *North-Wiltshire*. The Warren Part was once of vast Extent; but is now reduc'd to about seven hundred Acres: And tho' the Ground, which is now in Warren, is commonly judg'd to be one of the most barren Parts of *England*, from the exceeding shortness and smallness of its Grass, yet we are assur'd that those Parts, which have been plow'd up, of the same Kind, at the Reduction of the Warren, produc'd the most luxuriant Crops of Corn, that has been known to grow in the Kingdom; which happen'd, as is suppos'd, from the Soil being render'd fine, by the working of the Rabbits; and also from the large Share of vegetative Salts, proceeding from the Dung and Urine, which by plowing were regularly mix'd, and thereby render'd fruitful.

The Soil is Chalk, partaking a little of a reddish sandy Loam, somewhat stoney, with an hard Rock at the Bottom. The Surface, which is hardly more than two Inches in Thickness, partakes more of the Loam than the Chalk; and upon the nicest Observations, I could not find any other Herb growing upon it than Nettles, Ragwort, and Silver-weed, and those only
where

where the Ground had been disturb'd in some Places. I also observ'd the Elder to thrive very well in this Warren; and I suppose that many other Kinds of Trees and Herbs might be made to grow there, if they were cultivated, as I shall endeavour to prove by and by, from Example.

'Tis remarkable however, that the Rabbits of this Warren, as it is now, are very fat in the dryest Summer; and even in the most severe Winter, their Kidneys can hardly be discover'd for the Fat upon them; this last I imagine may depend partly upon the Fodder which is given them in the severe Season, and when the Snow is on the Ground, as well as upon the Fineness of the Grass they feed upon in the Summer: The Fodder given to the Rabbits in the Winter, besides the fine Hay of that Country, is chiefly the Hazle, whose Bark they devour very greedily; and as I observ'd before, the fine Grass which they feed upon in the Summer, is very nourishing to them, and keeps their Bodies in good Plight, from a Virtue in it, which prevents the Rot among them; so I suppose that the fine Hay of that Country, and the Hazle Bark, contribute no less to their Welfare, by furnishing them with Nourishment, not overabounding with Moisture: And in the Pasture Grounds about this Warren, which are like it in Soil, it is observable, that the Sheep are never subject to the Rot in the wettest Season; and tho' one could hardly think the Grass was long enough for their Bite, yet many Cows are kept upon that short Turf, and receive so much wholesome Nourishment from it, that their Milk is much richer than that of the Cows in the Vale, where the Grass is luxuriant, insomuch that upon
Trial,

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Trial, two Gallons of the Milk of the *Aubourn* fed Cattle upon short Grass, always yields more Cream than three Gallons of Milk of the Cows fed in the Vale upon long Grass: So that the Cheese made from the *Aubourn* Cows, is much richer and fatter than what is made from the Cows of the Vale, as I find by Experience. Indeed, the Cows which feed upon this short Grass, hardly yield three fourths of the Quantity of Milk that the Cows of the Vale usually do; but then the Goodness of it is so far beyond the other, that if it was but half the Quantity, the Price of the Cheese made of such Milk will sufficiently recompense the want of Measure; but especially if the same Method was taken here in making the Cheese, as is used at *Stilton*.

From these Examples, we may conclude, that there is in this sort of Grass, an excellent rich Quality, which affords an extraordinary Nourishment for Cattle, and renders them healthful and wholesome for our Use; for as they are well nourish'd, and preserv'd in Health, by such Food, so we may reasonably judge, that the Flesh of such Animals, and their Milk likewise, which is free from Distemper, must be nourishing to Mankind, who makes 'em so great a Part of his Diet.

And now I have done with the Soil, as far as it concerns the Rabbits and their Food, it will be necessary to hint that this Warren is wall'd about so that they have not the Liberty of searching their Food elsewhere; therefore 'tis only what they get in the Warren which brings them to that Perfection, and gives them their superior Value over other Rabbits.

Of

*Of the Number of Rabbits necessary to
Stock a Warren; and of the Value of
good Rabbits.*

MR. Gilbert, who is the present Master of *Auborne* Warren, and has all his Lifetime been bred up in that Way, tells me, that it is necessary always to keep eight thousand Rabbits for a Stock, in about seven hundred Acres of such Ground; and judges, that one Year with another, the Increase from such a Stock is about twenty four thousand Rabbits; but these are subject to many Accidents, by Poachers, Weezles, Polecats, Foxes, and Distempers, tho' the greatest Care be taken of them by watching, setting of Ginns, or in their Food. To view the Warren in its present State, one would suppose that the Food there would hardly maintain half so many; but yet we find by his Method of Management, that he loses few of them, and his Warren is always in better Case than others, and his Rabbits of a greater Price; they are known from others by being shorter legg'd, and shorter body'd, and thicker; and are highly admir'd for the extraordinary Sweetness of their Flesh, which is as far superior to that of other Rabbits, as the Down Mutton excels the Flesh of the larger Kind of Sheep fed in long Grass.

The Time when he first begins to kill them in Quantity for the *London* Markets, is about *Bartholomew-tide*; and from that Time to *Michaelmas*, delivers them at *London* for 9 s. per Dozen, free of Charges; but from *Michaelmas* to *Christmas* has 10 s. 6 d. for each Dozen delivered

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vered in *London*, himself being still at the Expence of Carriage, which amounts to 1 *l.* per Hundred, which is six Score. The Reason, he tells me, why the Price of Rabbits is less between *Bartholomew-tide* and *Michaelmas*, than between *Michaelmas* and *Christmas*, is, because the Skins are not perfect till *Michaelmas*, and then they are not worth above a Penny a piece, and then the warm Weather will not suffer the Rabbits to keep fit for eating above two or three Days; but from *Michaelmas* to *Christmas* the Skins are in Perfection, and are worth near 6 *d.* a piece, or about 5 *s.* per Dozen, and the Weather will suffer the Rabbits to keep perfect for four or five Days after killing. This explains to me a Difficulty which otherwise I could never have surmounted; for it is commonly practis'd in *London*, to sell the Rabbits without their Skins for 10 *d.* or 12 *d.* a piece till about *Michaelmas*; and from that Time to *Christmas*, when the Poulterers paid dearer for them, they have been bought for 8 *d.* and 7 *d.* a piece, and even sometimes for 6 *d.* but it appears by this, that 'tis the Value of the Skins, which is the chief Occasion of the different Prices.

He acquaints me farther, that when a Skin is in Season, the Wool or Fur is not all of the same Fineness, the coarser Sort is worth perhaps 3 *d.* per Pound, the next about 5 *d.* and the finest, which is in the Poll of the Neck, is worth about three times as much; but when the Skin is not in Season, I am told that 'tis so hard to separate the little good Wool from the bad, that the Trouble is almost as much worth as the Wool it self; and therefore it appears, that the Wool of a Rabbit in Season, is worth full as much as the Flesh of the Rabbit, and we have

and are very often deceiv'd by it, as that it is generally mixt with old, and does not bring half a Crop:

'Tis therefore I shall begin with the gathering and threshing out the Seed, that we may be at a greater Certainty in our Husbandry of this Herb, and have the Benefit of it in our selves, without being oblig'd to a Foreign Nation, who may one time or other perhaps find an Occasion to quarrel with us; for surely if private Friendship is not always lasting, publick Friendships are much less so, as they depend upon the Minds of many Men, which naturally must be subject to change; and I think it is not against the Interest of my Country, if I endeavour to promote the Culture of every Thing among our selves, which at present we must go abroad for. The State of Timber is now very low in *England*; and it is observable, that our Plantations abroad have furnish'd us very notably with Vessels built there; and even Timber has been brought from thence to us for Ship-building: But would the Art of Ship-building have been known there, if we had had sufficient Materials of our own to have built Ships? The Neglect of some of our Ancestors has, I fear, rous'd the Minds of other Nations to change their sleeping Strength into lively Force. In a Letter which I have lately receiv'd, a Gentleman observes, that the natural Genius of our Nation; and the natural Productions of our Country, are each of them extraordinary enough to set us above all other People in the World. In this Strength, says he, (very merrily) we indulge our selves, till we become indolent enough to forget that our Store is not for ever lasting, or that there are People abroad,

broad, who know how to envy our Liberty and Property, and turn our Neglect to their Advantage. The same Gentleman observes likewise, that we cannot be too industrious in providing our Country with such Things (while we are at Peace with other Nations) as we might not be able to compass in Time of War, and above all, such as are useful to our Navy, the invincible Walls of *Britain*. The planting of Firr-Trees he recommends as useful and necessary to the Publick, and profitable to the Planter. In the North Parts of *Britain* there are now Firrs fit for Masts of the tallest Ships; and the Pitch Firr should not be neglected, tho' we are happy in a Soil about *Staffordshire*, which yields excellent Pitch. He adds likewise, that we have waste Grounds enough to afford a sufficient Quantity of Hemp for our Use, and Flax might as well be cultivated with us as in Foreign Countries: But especially, says he, let us no longer delay to make a Provision for Oaks, for tho' they are a little tedious in their Growth, we ought to have so much Regard for our Successors, that they may not want, or be provok'd to curse their Ancestors for Neglect. But let us now return to the Point in Hand, viz. the saving the Seed of Clover in *England*, rather than depend upon other Nations for it.

One of my Correspondents, who signs himself *J. Hagar*, tells me, that in *England* an expert Man can only thrash about Half a Peck of Clover-Seed, or at most a Peck in a Day, for want of the Art which they have in *Flanders*, where Twenty five, and Thirty Pecks of Seed are easily clean'd in a Day by one Man. In *Flanders* I have seen two or three Ways of

N

doing

doing it by Engines, after the Heads of Seeds are thrash'd off with common Flails: The Engine which I best remember, has an Hopper at the upper End of a Trough, so that the Heads of Seed fall continually from the Hopper into the Trough. The said Trough is about six Foot long, and about two Foot and a half over, and lies slope-wise from the Hopper, which is at the higher End, so as to drop at the other End about a Foot: The Bottom of this Trough, within side, is made rough by Chissels, and upon that is a broad Board, made to draw backwards and forwards, which is cut in a rough manner, like the inside of the Bottom of the Trough. When the Heads of Seed fall into the Trough at the upper end, the broad Board in its Motion draws them thro' the Trough, and thereby breaks or opens the Seed Vessels, so that the Chaff and the Seed run out of the lower End ready for Winnowing: This Motion is maintain'd by a Water-Wheel and a Crank, and answers very well the Purpose it is design'd for. I have seen an Engine of this kind, where the Bottom of the Trough was an Hurdle, more finely wrought than our common Hurdles; and the sliding Part, which I call the broad Board, was an Hurdle of the same Make. In this I found, that most of the pure Seed fell thro' the lower Hurdle, and little more than Chaff was discharged by the lower End of the Trough, and consequently must give less Trouble in the winnowing or cleaning from the Chaff.

I have seen also another kind of Mill or Engine for this Purpose, which somewhat resembles the Mill which Tanners use to grind their Bark. In the former I should have mention'd, that

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that there is commonly a Weight laid upon the upper Hurdle or broad Board, the better to break the Heads of Seeds that pass between that and the Bottom of the Trough.

When we are thus provided with the Seed, we are to choose our Ground; and from Experience we find, that such as our common Heath Land is very proper for it; *that is*, the Seed will grow well there without much Manure, and bring the Farmer Profit where he has had the least Expectations: 'Tis in short the affording the proper Plant to the proper Soil, which agrees with the Husbandry I endeavour to promote, and of which we have many Instances; but tho' this Soil is good for Clover, there are others that are light, and sandy or gravelly, or tending towards Loam, which will produce it in good Crops; but the last kind of Soil will bear other Things, and therefore we shall chiefly treat of the Heath Grounds, how they may be improv'd by it.

When therefore we have a Parcel of Heath Land before us, the Heath Turf must be first turn'd off and laid in Heaps, to be burnt for the Manure of the same Spot it was taken from: But a common Plough is not proper to do this; for in tall Heath, Horses cannot, without great Trouble, draw a Plough, therefore it must be such a Plough as is not drawn with any Cattle.

About a Year ago some *Italians* brought over a Plough, which they gave us for a new Invention, for labouring of Ground without the Use of Horses, or any Cattle, and would turn up Land about four or five Inches deep in the Place which they made a Shew of it, that was, near the old *Mulberry-Garden* behind *Buckingham*

House; but it was easily discover'd, that their Plough would not be of Service to turn up a Furrow, or work deep enough in stiff Clay Grounds for Corn. I could not, however, help admiring the Invention, because one Man could work it in the tender Earth of the Garden they plough'd in; but afterwards mentioning this Rarity to Mr. *William Keys*, of *Tutbill-fields*, he assur'd me it was the very same with the Breast-Plough, which is commonly us'd in *Worcestershire*, *Gloucestershire*, and some Parts of *Staffordshire*. His Account of it was, that in the Counties in *England*, which he had nam'd, it was call'd a *Breast-Plough*, and was push'd along by two Men, in such Grounds where Horses or common Ploughs cannot go; the Use of it, says he, is to open or turn up the Turf in those Lands that are Heathy, Rushy, or incumber'd with Brakes, Fern, Gors, Whins or Furz, in order to burn or *Devonshire* the Land. But this Plough, as himself and some others observes, is never us'd to plough for Corn, because it does not enter the Ground deep enough.

However, for our present Purpose this Breast-Plough is convenient, 'twill open our Land for other Ploughing, and the Turf which it turns up must be laid in Heaps, to the Proportion of one Hill upon every Rod of Ground, or such a Parcel of Land as is sixteen Foot and a half Square; we are then to burn these Heaps, and after a few Days spread their Ashes over the Land, in order to be plow'd in.

The Husbandmen in *Devonshire*, when they have reduc'd these Heaps of Turf to Ashes, add to every Hill about a Peck of unslack'd Lime, which they cover over with the Ashes, letting

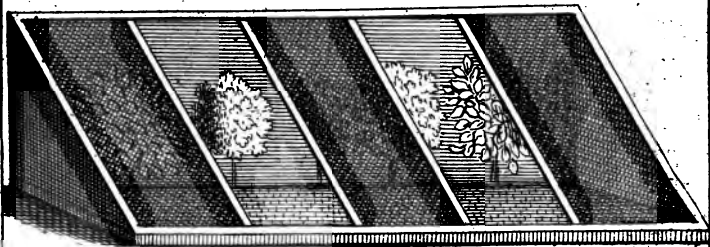


Fig. 1.

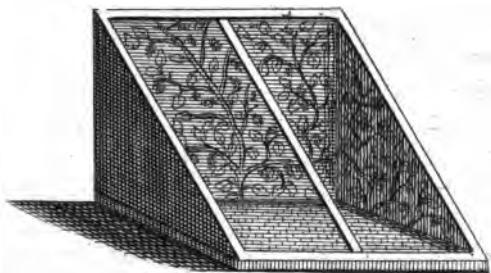
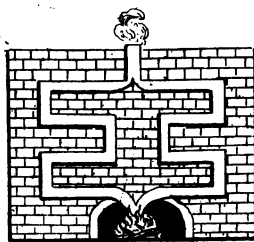


Fig. 2.



letting those Hills remain till the Rains fall upon them, and open the Parts of the Lime ; after which they mix their Ashes and Lime together, and spread it over the Land. For Ploughing in this and the former Case, be it which it will, the Ground should not be turn'd up above four Inches deep, lest the Ashes alone, or the Mixture of Lime and Ashes, shou'd be bury'd beyond the Reach of the Roots of the Clover, which does not strike its Fibres very deep ; and therefore it may be the Breast-Plough may go deep enough for this Purpose, but I believe will save little Expence.

In the Ploughing for this Seed we must lay our Land as level as possible, and sow the Seed soon after the Plough, harrowing it with Bushes that are press'd with a convenient weight ; and as a light Land is chiefly desir'd for this Seed, we should contrive to plough and sow the Land soon after Rain.

The Seed-Time or Season for sowing this Seed, is about *March* or *April* ; and if we sow it simple, or without other Grain, an Acre will take up about Ten or Twelve Pounds of Seed, for the Seed is small ; but if we sow it in Partnership with Barley, Oats, or Rye-Grass, which last they call *Ever*, or *Everlasting Grass* in the West of *England*, then about half the Quantity is enough.

I have observ'd, that when it has been sown with Barley, the Crop of Barley was very good, and there has been a good Crop of Clover mown the same Year, after the reaping of the Barley, and after that, a plentiful Graze for Cattle in the Winter. The Clover Plants in this Case grow strong and vigorous ; for when the Barley is ripe, the Roots of the Barley draw

no more Nourishment from the Clover, but decay, and rather assist it.

On the other Hand, where it is sown with the Grass call'd *Ever*, it does not grow, by three parts in four, so strong as when it is sown with Barley or Oats; because the *Ever-Grass* is continually entangling its Roots with it, and voiding the Earth of its nourishing Faculty, so that the Clover gets its Nourishment with Difficulty, and 'tis very likely has not above a fourth part of the Food that it requires.

If we make this Clover a Crop of it self, we find it more luxuriant than in either of the former Cases; and it may then be cut three times in a Year, and leave a rich Grass for Winter to feed Cattle. We may judge of the right Time for cutting it, by examining when it begins to knot, and then we may surely go about the Work.

Clover is a Plant which will blossom and bring ripe Seed the very Year of sowing; but when we have a mind to save Seed from it, we must cut our first Crop in *June* (as I have said) as soon as the Clover begins to knot or joint, and the Crop following must be left for Seed, because then our Field of Clover will, by means of the Cutting, branch into more Seed-bearing Parts than it had before the Cutting, and consequently will bring a greater Quantity of Seed. And again, we must observe, that the Year which we design our Clover for Seed, we can only cut it twice, because of the Time the Seed takes to ripen, or else we may expect three Crops from one Piece of Ground, as I said before, which makes excellent Hay. When we save Clover for Seed, we must remember to let it stand till the Seed is full ripe, and thrash
off

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off the Heads to be open'd by the Mill I have mention'd. An Acre will commonly afford five Bushels of clean Seed.

It is related, that the long Stalks which remain after thrashing, are nourishing Food for Cattle; and even when they grow dry and hard, we may boil them, and they will make good Mash, which will be profitable to Hogs.

This Herb is not long before it springs, tho' it be close cut; and when the last Cutting, every Summer, either for Hay or Seed, is over, we may turn in Cattle upon it, lest it grow too rank to bear the Winter. It has been observ'd by some, that one Acre of Clover, well manag'd, will feed as many Cows as six Acres of common Grass, and make the Milk much richer, besides keeping the Cows deep in Milk; or, in other Terms, making the Cows give more Milk at a Meal than common Grass.

But where this Clover is not common enough to afford us sufficient Pasture for our Cows in the Winter, we may partly make Amends for the want of it, by feeding them with Grains, which are left of the Brewing of Malt, and good Barley Straw. This Food, if it is given them discreetly, makes them yield a great deal of Milk of good Quality; but especially I observe, the Barley or Oat Straw, which is mix'd with Clover, is preferable to any Straw which has not Clover with it. This Mixture adds greatly to the Benefit of the Cattle that feed upon it.

A Field of Clover will last in good Strength about five or six Years, according as the Soil is more or less agreeable to it. And when we find it begins to decay, I am told, that being

plough'd up, it will yield good Wheat for two or three Years, and after that a good Crop of Oats, without any Manure; for Clover meliorates the Ground for Corn, or at least does not draw any Nourishment from the Ground, which is necessary for the good Growth of Corn; it is held rather to be a Manure for Corn, and that its Parts, which become rotten in the Ground by Ploughing, yield such Salts as are of Service to the Vegetation of it, but of Wheat especially.

Some tell us, that after we have had Corn two or three Years upon a Clover-Ground that has been broken up, and have the fourth Year sown that Ground with Oats, that we may, when the Oats are just come up, sow the same Ground again with Clover-Seed; and that when the Oats are cut, we shall find a good Crop of Clover at the Bottom; and at this sowing there is no need of covering the Clover-Seed, for it is so ready for Vegetation, that it will find its way into the Ground, as we may observe in many other Seeds of the like Nature, which will bury themselves in the Earth they are laid upon, without Help. Upon this new Clover we may begin to graze our Cattle soon after the Oats are off, and so continue till the following Spring, when we must fence it for mowing; and that Summer we may expect three Crops, as we had in the Years before-mention'd.

While I am writing this, a Gentleman has brought me a *Memorandum-Book*, wherein are collected many curious Observations concerning Clover, which may be instructive to my Reader.

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The first is an Account of the Profit made by Glover Grass upon a small Quantity of Ground.

The Ground which was planted did not much exceed two Acres, and the Quantity of Seed upon each Acre did not exceed fifteen Pound Weight; the whole Expence of preparing and sowing this Piece of Ground amounted to about five Pounds, which was over-paid by the same Summer's Crop of Barley. The following Year, about the End of *May*, the Clover was mowed, and amounted to two Loads, for which five Pounds was refused.

The next Crop stood for Seed, which was ripe the *August* following, and was then cut, and produced three great Loads, which were computed worth nine Pounds as the Year went; out of this mowing was gain'd three hundred Pound Weight of Seed, some of which was sold for sixteen Pence *per* Pound; the whole Profit of that Year amounted to thirty Pounds, besides the After-Pasture.

The next Observation is of forty Pounds of Clover Seed that was sown upon four Acres of Land, which brought at twice mowing, twelve Loads of Hay, and twenty Bushels of Seed; that is, three Loads of Hay upon an Acre, and five Bushels of Seed. The first Crop was mowed on the nineteenth of *May*, and was valued at twice as much as common Grass made into Hay, and the After-Pasture yielded as much Food for Cattle as three times the Quantity of Ground with common Grass would afford. The whole Account of these four Acres of Clover in one Year, was upwards of fourscore Pounds.

The third Observation is of Clover Seed, sown thin with common *English* Hay Dust upon bare

bare Rubbish Earth, which the *April* following thoroughly cover'd the Ground, and brought a full fresh Bite of very rich green Sward. This Clover Seed was saved in *England* from a neighbouring Ground, where the Clover had been cut twice in one Year, at both which Cuttings there was ripe Seed; the second Cutting was observ'd to bring more and better Seed than the first. It is likewise remark'd, that the Seed saved here from the *Dutch* Plants, thrives better with us than the *Dutch* Seed.

Nov Fourth Observation is of *Dutch* Clover Seed, that was sown with Hay Seed in a Garden, and of the same Seed sown with Barley in a Ground adjoining, which was a red sandy Soil. The Seed which was sown with Hay Dust was better swarded the first Year, than that which was sown with Barley. But in this *Memorandum* it is remark'd, that Clover does much better to be sown alone, than with any other Seed or Grain.

Nov Fifth Observation. Oats are the best Corn to be sown with Clover, about the Middle of *April*; about three Bushel of Oats to an Acre, will be enough to yield a middle Crop. These Oats will shade the Clover in the great Heats, and leave the Clover at the Time of mowing about three Inches high, which will afford an excellent Pasture in *September* or *October* following.

Sixth Observation, Six Acres of Clover, by cutting and feeding Cattle in Racks, from the Middle of *April* to the Middle of *October* next following, maintain'd thirteen Cows, ten Oxen, three Horses and twenty six Hogs; which, after the Rate of one Shilling *per* Week for each of the Kine and Horses, and two Pence *per* Week for each Hog, comes to upwards of thirty

ty Shillings *per* Week, or forty Pound for the twenty six Weeks. The Summer Profit then of every Acre amounts to about six Pounds, thirteen Shillings and four Pence, besides the latter Mafs or Winter Grafs, which in Clover Ground is judged to afford as much Food for Cattle in every Acre, as six Acres of common Grafs would do; so that in the six Acres we mention, we might feed as many Cattle in the Winter as thirty six Acres of common Grafs would feed.

Seventh Observation. It is observable, that where Clover Seed has been gather'd from one Piece of Ground to the Quantity of four or five Bushels, and has been distributed among several Hands, it has failed coming up in many Places, though in others it has grown very well; which has given a Mistrust to those who did not succeed in their Seminary, that they had old Seed; or to some more curious, that it was not grain'd or enliven'd by the *Farina Fecundans*, which I have, with others, mention'd to be the Impregnator of the Seed. But I rather think the Fault might happen by sowing the Seed too deep in the Ground, or in furly stiff Ground, where the Seed could not make its Way: For the Seed of Clover, as it is small and tender, will not bear deep plowing or deep covering, but covets light Land, a shallow plowing, and very little covering, nor above half an Inch deep at most.

Eighth Observation. That Grounds sown with Clover will nearly treble the Rent of the Land, or an Acre so order'd will yield to the Owner about five Pounds more than other moderate Lands cultivated with common Grafs; but if it be continually cut or mown, as the
Clover

Clover springs or rises, it will grow weak and be impoverish'd ; but to graze it we shall reap vast Advantage ; it springs before other Grass, and eight Sheep may be kept upon an Acre, which is near as much more as an Acre of the best Marsh Land will bear ; this Pasturing of Clover rather improves than impairs it.

It remains only that I inform my Reader, that the Clover I have mention'd in this Treatise is the great Clover, which was first brought to us, and still is imported by some People in Seed from *Flanders*.



C H A P. IX.

*Of improving Land by Beans and Pease,
and of meliorating Corn by Brining,
with a Method of improving Land in
Worcestershire, Gloucestershire, &c. or
any of the Coal Countries.*



*Observations concerning the Improvement of Beans
and Pease. In a Letter to Mr. R. Trotter of
Newbold Verdon, in Leicestershire, May 3.
1722.*

S I R,

YOUR great Curiosity in Husbandry gives me an Opportunity of communicating to you some Thoughts and Experiments, which will be of great Advantage to those who cultivate Beans and Pease, either for Seed or otherwise.

First, It is a common Custom amongst the Farmers, when they are once provided with any sort of Seed, to sow the same Sort continually upon their Farms, and thereby render it, in Course of Time, quite unprofitable; for where any Sort of Seed, tho' never so good at first, when 'tis brought into a Country, has been cultivated for three or four Years successively in the same Air and Situation, tho' the Spot of Land be varied from Acre to Acre, or those Grounds enrich'd from Time to Time with Manures; yet Experience shews us, that such
Seed

Seed will degenerate, and lose its first Excellence; so that, as I have observ'd in some of my monthly Writings, I still advise, that when we once become Masters of a good Sort of Seed, we should at least put it into two or three Hands, where the Soils and Situations are as different as possible; and every Year the Parties should change with one another; by which means I find the Goodness of the Seed will be maintain'd for several Years. For want of this Use, many Farmers have fail'd in their Crops, and been great Losers. When I have had the best Sorts of Lettuce, Onions, Pease, Beans, and other Seeds, I have found that, in a Year or two, they have degenerated in my Garden; but the Seeds of them which I gave away to my Friends, preserv'd their first Goodness; and I have receiv'd some Seeds of their saving, which have brought me as good Crops as I had at first.

Secondly, It has been a great Neglect, that our Farmers have not been Curious enough to enquire into several Sorts of Beans and Pease, which Kinds of them produce the greatest Crops. I have known some Kinds of Pease that have produced about forty Cods each Plant, and each Cod two, or at most three Pease apiece. So that to make an easy Computation of the Increase of one Plant, it might produce in a Year (or Summer) about a hundred Pease for Seed. On the other Hand, we have some Sorts of Pease that will produce about thirty Cods upon a Plant, and one with another, will yield seven or eight Pease each Cod, and then a single Plant will yield in one Year after the Rate of seven in each Shell, two hundred and ten Pease, which is above double the Number of those mention'd above, and the Pease are also larger than those
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that bring so few. So that in the Measure, there will be near two Thirds difference, between the first and the last Kinds. In Beans likewise, it is observable, that some are apt to grow tall and long-jointed, while others are low and short-jointed, and bear full Crops of Fruit, even to yield half as much more in Measure as those do which are long-jointed. Mr. Smith, a good Gardener at *Putney*, is, I think, the only one who has taken Notice of this, and has gain'd Profit by it. Among some Soil which was brought into his Garden, there was a Bean accidentally grew up, which brought a greater Quantity of Beans than ever he had seen before upon one Plant; he saved the Seed of this, and by changing it from Place to Place, became Master of the most profitable Sort of Bean in that Country, and now uses no other Sort in his Garden. 'Tis now a Time of Year when Things of this Nature should be enquired into: I have already mark'd several near *London*, and I wish you would do the like in the Country; for in these Plants we ought as much to observe, which are the best Bearers, as when we chuse our Fruit-Trees, for the Profit will be in Proportion. Neither do I find that these profitable Sorts of Beans and Pease are less agreeable to the Taste than the others; the larger Kinds are generally as sweet as the smaller Sorts: And 'tis a Maxim founded upon Experiment, that the larger a Bean or Pea is, so much more Room and Air it requires to perfect its Growth, and ripen its Fruit.

Thirdly, It is a Custom among the Farmers (without great Reason) to sow some Crops of Beans and Pease before *Christmas*, and others early in the Spring, as in *February*, for Example;

ple; the Consequence is, That these two Crops bring their Fruit at one Time, and therefore, about *London*, the Markets are glutted with them, and their Price is small. Besides, those that are put in before *Christmas*, are endanger'd by the Frosts, and are often lost, which is a Hazard that we need not venture, unless we have Shelter for them, and the Help of a Wall.

But let us suppose that we have three or four Crops, which were planted at as many different Seasons, that all are tending to bear Fruit together, as I have observ'd oftentimes; we may prevent this Inconvenience two Ways: Either by Transplanting some of them, when they are about four Inches high, or cut them down when they are about that height; and then we shall find a considerable Difference in the Ripening of their Crops. But if we let them grow till they are knotted for Blossom, before we cut them down, then the young Shoots which spring from the Bottom, will, in a little more than a Week, if the Weather be hot, shoot out full of Flower-Buds, and come not above a Week later than they would have done, if they had not been cut down. For the Juices in the Plant were then all so well digested and prepar'd for Blossom, that where-ever they could spring or appear, they must immediately tend to Flower; whereas, when the Juices in the main Stem, were raw and undigested, and the Design of Blossoming was not perfect in it, then the Juices in the other Part of the same Plant, must be of the same Kind; and a Plant cut down in that State, will sling out Off-sets, which, besides a Time for their Growth, must have due Time to digest and put themselves into a Bearing Posture; which, from Observation, I find to be a Month or
five

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five Weeks, if the Weather be moderate; or somewhat less, if it is very warm.

I am yours, &c.

R. B.



A Method of improving Ground in Worcester-shire, Gloucester-shire, or any of the Coal Countries.

TO introduce this Method among such Persons as are willing to improve their Lands for Corn; in such Places, where Coals are found in Plenty, it will be necessary to observe two Things.

First, That the Land in such Countries is generally strong Clay; and most frequently is that Kind, which is call'd blue Clay.

Secondly, That Pit-Coal, when it burns to Ashes, is generally reduc'd into sharp Particles; as rude to the Touch, as the sharpest Sea-Sand; and therefore there cannot be any thing more proper to divide or open the Parts of the stiff Clay, than such Coal-Ashes. But, concerning the Salts which are found in Ashes of all sorts, I shall not here take Notice of them, nor their Use in Vegetation: Having already, in my former Works, mention'd something relating to them.

A Gentleman, who some Years since bought an Estate in *Worcestershire*, was, as I am inform'd, the first who made use of Coal-Ashes to mend his Ground in that County; he had Courage enough to withstand the Ridicule of the Country People, till his Crops open'd their Eyes; and since that, his Method is become the common Practice with extraordinary Success. But before I enter upon his Method of proceeding, it may not be amiss to observe, that the Farmers of *Worcestershire* were us'd to practise that Way with their Land before his Time, which is call'd *Devonshireing*, which is by cutting off the Turf or Surface with a Breast-Plough, and laying it in Heaps over large Faggots of Furze, and setting the Furze on Fire in order to reduce the Turf to Ashes; by this Means a great Part of the Turf is burnt, but the whole Heap is never so entirely mellow'd by such Fires, but that some Turfs are left untouch'd, so that they must be afterwards broken to Pieces by some Instrument: This they afterwards spread over their Land, and plough'd it in to sow Corn upon.

The Gentleman I speak of, which began the Improvement, had upon his Estate several Coal-Pits, and a Parcel of Land over-grown with Furze-Bushes, so that he wanted not for Materials to burn his Turf without extraordinary Charge, and so thoroughly, that one of his Heaps would make twice as much good Mold, as the Farmers had in one of theirs.

He had several Coal-Mines upon his Estate, and found there great Heaps of the smaller dusty Coal, round the Openings or Mouths of the Pits; this he resolv'd to use upon his Land,
in

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in Order to burn it to better Purpose than his Neighbours did with Furze alone; and therefore instead of making large Faggots of Furze, he only made small Brushes, big enough to set the Heaps of Coal and Earth on Fire; thus having prepar'd a sufficient Number of Brushes, he cut up the Turf, and made his Heaps of Earth and Coal in Lines, about four Feet Distance from each other, and to every Heap put one Brush only. When these Heaps were well consum'd, he began to plough along the Sides of these Heaps, till he had plough'd to a second Row of Heaps, and then spread one Row of Heaps upon the fresh plough'd Land, and so on till he had plough'd over his whole Ground; then with a Breast-Plow, he mix'd this fine Mixture with the Earth, and sow'd Wheat upon it, which prov'd so extraordinary a Crop, that all the Farmers in his Neighbourhood follow'd his Example; and by this Practice, his Land which was at his first coming to it, worth hardly ten Shillings *per* Acre, is now worth two Pound *per* Acre.

Considering that the small dusty Coal is esteem'd as nothing worth, and thrown away in the Coal Countries at present; this Hint may not be disserviceable to the Farmers in such Places.

The following Letter seems to come from *Farnham*, or thereabouts, as I guess from some Remarks which I have receiv'd, written in the same Hand, and also from the Nature of the Soil mention'd in this. And as it relates to the Improvement of light Land, by Brining of Corn, I think it very necessary to insert it, with a few Remarks.



To Mr. BRADLEY,
 March 20. 1721.

SIR,
 Finding by your Treatises upon *Husbandry* and *Gardening*; that you disdain not to accept of the least Hints upon those Subjects, I thought it would not be taken ill if I should drop in my Mite.

A sort of a Chymist came down to these Parts some Years ago, to teach us a Dressing for Corn, by the Way of Brining; which applied to Wheat, or Barley, would, as he said, make the poorest Ground bear a Crop continually, and so rank, as that a Peck of Wheat less, *per* Bushel, would sow an Acre. Which some Gentlemen in this Neighbourhood tried with Success for two Years; but the Undertaker came into these Parts no more, and, by what I find, he could not afford to dress the Corn any longer at that Price, which was but ten Shillings *per* Acre; whereas, had he demanded twenty, those who have large Farms, with much light Ground, would have been glad of such a Dressing, for those Grounds which lay at such Distance, that the very carrying out their Dung thither, would have stood them in as much.

In

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In our Conference upon this Matter, I guess, that he dress'd with Oyl, alledging the Authority of *Virgil*:

Et nitro prius, & nigra perfundere amurca.

But we must consider that Advice to have been calculated for a Country where these *Fæces* are cheap. But what is the Quantity proper for each Grain, and whether it should be simple or mix'd, to make the Corn imbibe it, and at what Price to be purchased by those who have Use for a Quantity, I leave to the Curious to enquire; and shall only add, that if such a Brining could be brought to Perfection, so as to answer the Design at Twenty Shillings per Acre, it would, for all the light Grounds in home Countries, be the most beneficial Improvement that has been found out in these later Ages, and particularly to him who could keep the *Arcanum* to himself so as to have the Monopoly. If you do think it merits to be inserted amongst your Ingenious Discoveries, I wish our Country the Benefit of it, and you, Sir, the Credit; and am,

S I R,

Yours, &c.

T. S.

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In answer to this Letter, I shall take Occasion to observe, that in the common Way of Sowing Corn, our Farmers always allow too much Seed : The Grains are laid so near to one another, that light Land cannot nourish them when they grow up ; so that for to allow a Peck less in every Bushel, is but reasonable, and then there will be more Nourishment for every Grain, and every Plant consequently will have more Stalks and more Ears, and the Grains will be better furnish'd. I have try'd several Brinings for Corn, and one of them succeeds so well, that I have had many Roots that have produced upwards of one hundred Stalks apiece, especially about the Skirts or Outside of the Ground ; the Grains were laid about six Inches apart, and eat down by Sheep ; and here I may observe that twenty Shillings *per Acre* will more than pay for the Brining.





C H A P. X.

*Concerning the Improvement of Land, by
sowing of Onions, or planting of Saffron,
in a Letter to Mr. R. S.*

S I R,

AS I am under an Obligation of keeping a pretty large Correspondence, on account of my Studies, you will excuse me, that I did not answer yours sooner. Some are in more Haste than others; and unless the Occasion of Letters require immediate Dispatch, I answer them in Turn, as I receive them, which now and then has given Occasion to some Gentlemen to imagine I neglected their Friendship.

You desired my Opinion of Onions and Saffron, how they might be planted, and in what Soil; but I must assure you, there is no Time lost to you on that account; for, as your Letter bears Date in *September*, it was impossible to do any thing to the Purpose, in either propagating of Onions or Saffron, so late in the Year; for then Onions are out of the Ground, and Saffron is in flower, as you observe in your Letter; and it is next to Death to move any lasting Roots of that sort at that Time.

In the next place, as you desire to know the Native Place of every Tribe of Fruit which we now cultivate in our Gardens, it has employ'd much of my Time to discover to what Parts of the World we owe those several Enjoyments, as I shall mention in their Turn; for I think it will be no small Help to know the Climate in which every sort of Fruit had its Original Spring; for then we might have a better guess at the several Situations and Exposures necessary for each in our Gardens: Besides, by means of our extensive Trade, we may learn even the Qualities of those Soils which Nature has bestow'd on every Fruit-bearing Plant for its wholesome Nourishment.

But, to begin with the *Onion*: I am persuaded there is not any Root which brings more Profit to the Planter, with small Expence, than it self; for one Year I knew that much less than an Acre of *Onions* were sold for threescore Pounds, after they had been dry'd on a Kiln; but indeed that Year the Ground, by means of Frosts, was so confin'd, that the Gardeners, in many Places, had not Opportunity of putting in the *Onion*-Seed, till about the Middle or End of *March*, and some later, so that as they came out of the Ground the Fly destroy'd them; and as I have, more than once remark'd, 'tis about the Beginning of *April* that the Fly which infects the *Onions* in their most tender State commonly appears; and I find that the Person who sold those *Onions* had taken a more early Opportunity of sowing them than other People. For upon the first breaking of the great Frost, *Augo* 1714, he put in the Seed, and though it happen'd

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to freeze afterwards, the Seed shelter'd in the Earth began to prepare it self for that Germination, which appear'd before others had sown any Seed at all; so that when the Fly came in *April*, either through Shelter from Blasts, or the vigorous State of the young Plants, they were render'd capable of defending themselves against the Fly. But however, this may be suppos'd to be accidental, yet I find that an Acre of *Onions*, one Year with another, may be made worth upwards of forty Pounds; or even more profitable than if a Quarter of that Quantity of Ground was spread or cover'd with one Stratum or Layer of Apples, as close as they can lie together; for the Hough which goes between the *Onions* is but two Inches wide, or thereabouts, when they are bent in Growth; and the *Onions* in their Roots, when they are full grown, one with another, may be about an Inch and a half Diameter, so that my Conjecture is rather under than over the Matter; for in Orchard-Trees, I am very apt to believe the Apples produc'd by every Tree, lying in a single Layer upon a Flat, will not cover that space of Ground which the Tree spreads over, besides the common Hazard which the greater Bodies are subject to, of being frequently blasted by their more aspiring Growth, while the lower Race lie under shelter, and safe from the bolder Attempts of the Air: So that for this Reason an Acre of *Onions* are better than an Acre of Apple-Trees, not only each single Year, but one Year with another. To this I may add, that many sorts of Apples and *Onions*, when they are sold in tolerable Years by the Peck, yield
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about Six Pence *per* Peck ; these indeed are the Refuse or Scum of the Crop, but in the same Proportion, with regard to one another, do they bring Benefit to the Master, when they are the Choicest of the Crop ; for the best of the Onions are always clean'd and dry'd on Kilns, and are much more refin'd in their Flavour, and more gentle and sweet to the Taste than those which are not dry'd : By the first I mean those which are commonly sold about *London* in Ropes, and by the other I mean those that are sold by the Peck. The *Spanish* Onions are all dry'd, and therefore lose their pepper'd Relish ; and besides, by the drying of Onions, they loose that Spirit of Vegetation which would else promote their growing before we could use them in the Kitchen.

From hence I am led to think, that when any Onion begins to sprout, Nature is active, and then it desires the Earth, and should immediately be planted for to gather Seed from, especially if the Root is large, and promises Strength and Vigour ; for, how can we expect an healthful and vigorous Off-spring, unless the Progenitor has a natural and healthful Strength of Body ? Or, to follow the greatest Authors, we may say, that if we follow Nature, we are in the Road to Wisdom. It is certain, that when an Onion begins to sprout, it is its Time of growing, and the Earth is requisite then to support its Design : But it is not every Root of this kind which sprouts just at the same Season ; some will begin in *November*, some in *December*, and others in *January* ; but whenever any of them begin to
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shew their Disposition to sprout, then the All-wise Author of Nature has appointed them the Assistance of their natural Bed and Nourishment. This Argument cannot be easily overthrown by Men of Reason, because Reason is the Voice of Nature, as Nature is the Will of the Creator of Nature. Were we to speak of Brute Beasts, every one, according to his kind, has a certain Mode of Acting; so Vegetables have their natural Intent, and unless that is satisfied, the Consequence is dangerous to their Health: The natural Bent therefore of every Vegetable or Animal ought to be consulted, if we have any Regard to it, or otherwise we might often become Sufferers by the Neglect. From this Remark we may gather, that not only Onion-Seed, but all others, when they come from strong Roots, will produce more lusty Plants than the Seed which is sav'd from mean unnourish'd Roots.

In the laying up of Onions, we find that where they have not been well dry'd, or are laid too close together, or in two great Heaps, they sooner begin to sprout than when the more watry Parts are exhal'd by the Sun, and they are laid singly; so that 'tis necessary to guard against these two Evils, if we desire our Onions to last long in Kitchin-Use; but if we design to gather good Seed from them, the above Directions may take place.

Now, when we have taken this Care of the Seed, let us consider, from a preceding Argument, that we must sow it as soon as the Earth begins to retake its Power of acting upon Vegetables of this kind. My Relation will inform you, that the greatest Success was
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by putting in the Onion-Seed in *February*, as soon as the Weather was open; and it has been my constant Rule never to sow the Seeds of any Bulbous Root later in the Spring of the Year; And it is no less certain, that an Onion is so much a Bulb, that all Bulbous Roots are stil'd Onion-Rooted Plants. I find, that if I sow any of this sort of Seed later than *February*, my Seeds are in danger of being lost, either by Vermin in their tender State, or by mixture of Weather too rough for them, when they first appear above Ground, or else by a too dry Season, which is common in *March*, so that the Seed does not come up at all.

The Land which is commonly chosen for this Purpose is a generous Loam, which is suppos'd to consist of about equal Parts of Sand and Clay; and even though this Soil is more generally inclin'd to assist Vegetables than any other, yet it is thought by some to require a large Quantity of Manure or Dung, to make it agreeable to the Vegetation of Onions: But from my own Observation, I find that this Loam of it self, without the Charge of Dung, brings Onions as large and as good as the dung'd Ground: This I observ'd in some Gardens where the People told me they never had apply'd any Manure to the Land, but what they had now and then taken out of the Ditches, and the Drift Sand of the High-ways. In some other Places I took Notice of Onions of a tolerable good size, and extremely well tasted, which were sown upon a black sort of Sand, which Soil seem'd to be intermixt with about a third part of

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of Fibrous Roots, such as the Roots of Heaths ; and from the State of the Land about it, I am perswaded it was so, and had not been long enclos'd ; but however, the People told me, when I spoke in Praise of their Onions, and enquir'd how they had enrich'd the Land for them, that they had not done any thing more than dig it up and sow the Seed.

In my own Garden I have had as good and large Roots (of this sort) without using any Manure, as my next Neighbour, who has cover'd his Ground four Inches thick with Dung ; so that I am of Opinion, the great Expence of Dung may be sav'd in this Case, and that sandy and heathy Ground, and the Loam which I have mention'd, may by good digging or ploughing, and timely sowing, be render'd capable of producing a valuable Crop. I have seen an Acre or two of good Onions growing in a sandy Field, near *Windser*, where little Dung was us'd.

Again, in the Management of a Crop of Onions, we must observe, that when they are grown to be as big as the Stem of a Crow Quill, they must be hough'd, as well to clear them from Weeds, which would annoy them while they were young, as to set the Plants at a due Distance one from another ; the Breadth of the Hough Blade, as I have observ'd, is about two Inches, and it should be a careful Man who is us'd to the Work that is employ'd on that Occasion, for there is not only requir'd a great Care in treading over the Land, with regard to the young Crop, but a foreseeing Eye to guide and conduct the Hough forwards, that no more are cut
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up than what are necessary : In short, the best Husbandmen have given four Pounds, and four Pounds ten Shillings *per* Acre for this Work, when they knew their Workmen, as one may well guess at by viewing a little Piece of their Work, by way of Sample, about two or three Days after they had done it ; for then the Weeds which they had cut down will have little Appearance, and the standing Crop will shew it self, especially if we sprinkle Water over it, which darkens the Ground.

When your Onions are thus put into a thriving Method, we need have little Care of them till we perceive their Roots have nearly done growing, and then the common Way is to bend down their Leaves with an Arbour Pole, or any other Way more convenient ; for the common People suppose this Way stops the Motion of the Sap, and by that Means the Root benefits in its Growth, and if so, it is certainly worth while to do it ; for if every Onion in an Hundred, one with another, should gain two Ounces, and by this Means every Onion should gain but half a Quarter of an Ounce, then there would be a very considerable Profit ; and this additional Weight will likewise prove additional in point of Measure, so that an hundred Roots which might perhaps fill the Measure of a Bushel without such an Art used, then, if the Art used has the Effect 'tis supposed to have, we may expect half a Peck added to every Bushel, which at the least Price of those Onions, sold by the Peck, is Three Pence, which in an Acre well manag'd will about pay for houghing. I confess I have follow'd the old beaten

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Road so far as to do this, but I cannot be positive of the Success. All that I shall say therefore upon this Point is, that it is a receiv'd Opinion among Husbandmen and Gardeners, and wish that it has the Effect, which is commonly understood by it; a small Tryal cannot harm you very much.

When the Pipes or Leaves of the Onions begin to lose their juvenile, or youthful green Colour, and change yellowish, it is Time they are taken out of the Earth, and dispos'd in the best way to dry; therefore in rainy Weather 'tis improper to pull them out of the Ground; we should have some Prospect of fair Weather, as we consult in the way of cutting Grass for Hay, or reaping of Corn; for Onions must be well dry'd before they are laid up, or they will never keep for household Use; and I have known some People who have had the good Fortune to have cover'd Sheds enough to dry their Onions in, when Rains have begun to fall, which has been greatly to their Advantage; for about the Time of taking them up, it commonly happens that the rainy Weather begins, as it is uncertain, when Grass is cut for Hay.

And now, Sir, from these Remarks we may gather enough to answer the End of your Letter, as far as it relates to the Method of improving Land, by sowing of Onions upon it; how the Advantage may arise by saving of the Seed, is an Article which is not mention'd in your Letter. I shall now proceed to give you some Account of the Manner how to propagate *Saffron*.

Saffron

Saffron has a bulbous Root like the Spring Crocus, but much larger; the Flower is also in most Circumstances like the Crocus Flower, and of a blewish purple Colour, but the Times of blossoming of Crocus and the Saffron are different; the Crocus I speak of, appears in the Spring, and the Saffron Flower rises in Autumn; the Leaves of one, and the other, are nearly of the same Figure, but those of the Saffron are much the longest, and are of a deeper green Colour than are those of the Spring Crocus. It has been observ'd by some Authors, that the Saffron differs from our Spring Crocus, because it brings its Flowers naked, or before any Leaves appear, but so in effect does the Spring Crocus; for when the Flowers open, we can then narrowly distinguish the sharper Points of the Leaves, as we may do, when the Saffron comes to flower; the Pistils of the Saffron Flower, which are the Parts only used in the Shops, if they are not gather'd early in the Morning, while they are most prominent, will give us reason to complain, for when the Sun begins to influence them, they shrink into less than half their first Substance, and almost retire under Ground; so the Spring Crocus likewise does the same as soon as the Flower begins to open by the Sun's Warmth. I remember the late ingenious Mr. Moreland, F. R. S. who for a great part of his Life employ'd his leisure Hours in his Garden, told me first of the Pistillum of the Crocus drawing it self into the Ground at the Approach of the Sun, as much as its Parts could well bear to be contracted; and in that Gentleman's Company, I had the Pleasure of observing, that his

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Observation was exact and constant in near an hundred Trials of Flowers equally open'd; but in some others which were more open'd, the Pistilum was shorter, in those less blown, the Pistilum was longer and more spongy: However, at the Bottom of these are the Seed Vessels which lie within the Ground; and there is no Difficulty of saving Seeds, if we timely mark those Flowers we like. Mr. Fairchild has rais'd abundance of fine sorts of Crocus from Seeds, which he sav'd from the common sorts.

But now let us proceed to the Culture of Saffron; and first of all concerning the Soil about *Saffron Walden*, in *Essex*; which was once the Chief Market for it, as well as the principal Place of its Growth; but of late Years we find it cultivated in the Grounds about *Cambridge*, and in some other Places in *England*, and find it prosper well in almost every kind of Soil, except the stiffer sort of Clay.

The Soil then about *Saffron Walden*, where I have seen it grow, is a chalky Loam, but of that Kind which is most easily broken; in some Places there is a Coat of light Earth over the Chalk, about three or four Inches thick, which is sufficiently deep for Saffron Roots; in other Places I have seen some Beds of it prospering well in common Heath Ground, where the Surface had been burnt, and turn'd in by a common Plough. And I am satisfied from Experience, that the Saffron cultivated in this last sort of Land, is not any ways inferior, either in Quantity or Quality, to that which grows about *Walden* and *Cambridge*; so that

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some Gentlemen already, by my Advice, have planted some Acres of it upon heathy Ground, and such Land as was hardly worth one Shilling *per* Acre, and have had very profitable Crops; so that I do not doubt but their Example will be follow'd by many who are Masters of such sort of Land; for there is no want of Dung, or any other Manure in this Case, but what only is the Produce of the same Ground, *viz.* the Ashes of its Surface. We may observe, that whoever are the first Promoters of this easy part of Husbandry, will be the greatest Gainers, for as it comes to be more general, the Price of Saffron will assuredly fall, even though there will be a good demand for it; for the *English* Saffron is esteemed by all, to be the best in the World. I may observe by the by, that at present it is yet scarce enough to make it worth the while of some People to mix it with the Petals or Leaves of Marygold Flowers; which, was it in greater Plenty, would put a stop to that Adulteration of it; and question not, but in a few Years, to see rather too much than too little; for I find Men are generally so disposed to follow those Methods which have been profitable at little Expence to their Neighbours, that the Markets become over stock'd. Hops is a capital Instance of it, which when they were first propagated in *Hampshire*, raised very considerable Estates to their Owners; but since the Number of Hop-Gardens are so prodigiously increas'd, we find they are much lower in their Price, than they were about the Beginning: But however, there is time enough yet to get a great deal of Money by Saffron; and as such Land will do

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do for it as has been hitherto of small Regard, so every Acre which is cultivated in this manner, will be like a new Acquisition of Territory gain'd to the Publick.

To proceed then to the planting of Saffron: When the Ground has been well prepared with the Plough, we are to provide an Instrument like an Hough; but with a Blade much broader than that of the largest common Hough. Some Blades in the stiffer Grounds may be about a Foot wide, and for the more light and sandy Lands, the Blades may be about eighteen Inches. With this Tool or Instrument the Land is drawn into Ranges, somewhat like Furrows, about three Inches deep. When one Range is made, lay your Saffron Roots in it about three Inches asunder; when this Range is planted, then, with the same Instrument, draw another Range on the side of it, and the Earth which will be turn'd out of the Second, will cover the Roots planted in the First. In the planting this Root it should be observ'd, that the Depth of every Range or Furrow should, as near as possible, be the same: The Time of planting these Roots is commonly about *Midsummer*, for then the People in the Saffron Countries generally take up their Store out of the Ground, and then they may be bought in the Markets by the Bushel, which is not always of one Price. About that Season we may meet with them; and at no other Time. But however this Custom prevails in the Saffron Countries, I am sure from Experience, that Saffron Roots may as safely be taken up as soon as the Leaves are dead, as to let them lie in the Ground a Fortnight or three Weeks afterwards; for the dead-

ness or falling of the Leaves of any Plant, shews its natural Disposition to rest from Growth, and then it has no great Occasion for the Earth's Assistance, till the Time draws near to its awaking again to its Business of Vegetating. But the Ground being planted, some few Flowers will perhaps appear, in *September* following, naked or without any green Leaves; and about the End of *September* or Beginning of *October*, the green Leaves appear and shoot to a good Length: Then with an Hough, whose Blade is about three Inches wide, cut the Weeds which appear among the Plants; but the Leaves, which hold their Greenness all the Winter and part of the Spring, should not be disturb'd, for that weakens the Root. Hares are great Lovers of them, and therefore the Country People are oblig'd to fence in their Saffron Grounds with Hurdles, or other good Fence, to keep the Hares out.

The next Year after planting we may expect about a third or fourth Part of what they esteem a full Crop; and this Year, as soon as the green Leaves are quite decay'd, clean the whole Ground with an Hough, which will greatly help the Roots.

The third and fourth Years with this ordering, we may expect full Crops; but then the Roots, and their Offspring must be taken out of the Ground to make fresh Plantations; an Acre of Saffron-Roots of this standing will plant about three Acres and half.

When the Saffron comes to flower, the Blossoms must be gathered very early in the Morning, because, as I observed before, the Style or Pistillum, which is the pure Saffron, shrinks

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shrinks at the approach of the Sun: Therefore in great Saffron-Grounds, all the Hands they can get are employ'd to pick it every Morning while it lasts in Flower. We must understand that 'tis only the Style of the Flower which is the Saffron, the other Parts are of no use; and I am very apt to believe there may be good Saffron gathered from the blew Spring Crocus, for there is little or no difference in the Flowers of one or the other sort; and if so, the Spring will bear a tolerable Crop the first Year of Planting.

As they gather the Saffron, they put it between Sheets of white Paper, and dry it on little Kilns, which every one is provided with; and the Fire they use on this occasion is Charcole. At *Littlebury*, near *Walden*, the method of drying it may be best seen at the flowering Season; for there is so much an Art in it, that barely by that means, some Saffron is five or ten Shillings *per* Pound better than other.

About three Pounds of fresh Saffron will dry to about one Pound; and I have known sometimes the Year's Crop gather'd from one Acre, to amount to near eighteen Pound weight; but ten Pound upon an Acre is common enough. The Price it will bear in the Market, depends upon two things, besides Engrossing; first, the Plenty of it in the Market, and secondly, upon the good Management in drying it. As to the Quantity of it, which is some Years more, and some Years less, that is occasioned by the greater or less Number of full-cropt Acres which happen to be on Foot at one time more than another: for above four Years it must not stand in a place, but the Ground

broke up; and therefore it would be best ordered to keep a parcel of Lands so planted with Saffron, that the full Crops might gradually succeed one another, But if the blew Spring Crocus answers the End I propose, the Crop is much more certain, and its Culture still more easie. In dear Years, it has been sold for upwards of five Pounds.*per* Pound, and in some Years for a Guinea; but however it be, the Cultivator is still a Gainer by it,





C H A P. XI.

An Account of Bees, the Manner how they gather their Wax and Honey, of the Structure of their Combs, their Manner of breeding and swarming; with variety of curious Observations relating to their Oeconomy, by Mr. Maraldi; as also some Sentiments, which may be useful to such as either have, or design to build, Bee-houses, or study the Advantages of a well managed Apiary.

THE Naturalists acknowledge, that Bees are the most wonderful of all Insects: The Instinct they have to feed upon Flowers, and to gather Honey and Wax from them; the Order they observe in their different Occupations, their Government, Industry, and admirable Skill in carrying on their Work; in a Word, all the Dispositions that are to be found among those Animals, have engaged the Attention both of the antient and modern Philosophers.

Aristomachus, amongst the Ancients, spent eight and thirty Years in Contemplation of them; and *Hikifens* retir'd into the Woods,

that he might have the more Opportunity to observe them: Those two Philosophers, according to the Account given us by *Pliny*, wrote of the Nature of Bees; and they were the Persons, perhaps, who taught others how to order them, to provide Hives for them, and reap great Advantages from them.

We are beholden to *Aristotle* for the curious and useful Observations he has left us concerning this Insect, which *Virgil* has beautify'd, and put into *Latin* Verse: These Observations were afterwards confirm'd and improv'd by *Pliny*, and several ancient Philosophers.

Among the Moderns, Prince *Frederick Cesi*, the Institutor and Principal of the *Roman Academy of Sciences*, towards the beginning of the last Century, wrote a Treatise concerning Bees, as *Fabius Columna* informs us, which he presented to Pope *Urban VIII.* and gave us Hopes it should be printed, with a Description of the Parts of this Animal, by the help of a Microscope of *Stelluti*, a Member of the same Academy; but we know not what is become of that Work, no more than the Anatomy of this Animal promised us several Years ago by *Swammerdam*.

We have, notwithstanding the Observations that have been made by so many learned Persons, not declin'd to examine this Part of Nature, wherein we have been insensibly engaged, both by the Pleasure we have had in so curious a Study, and by the Conveniency of a great Number of Glais-Hives in *M. Cassini's* Garden, adjoining to the Observatory. As several of the Moderns, as well as the Ancients, have treated of the Methods how to manage these
Animals

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Animals in point of Profit, we shall wave that for the present, and content ourselves with inserting what we have found to be most curious concerning them.

We shall give you the Origin of Bees, the different Species in the same Hive, the small Number of those appointed for Propagation, and the Numerousness of those that work: We shall explain to you how these gather Honey and Wax from Flowers, and how, being engaged in different Occupations, they assist one another in their Work: We shall give you a Description of the chief Organs of Bees, and explain the Manner how they build their Cells and Honey-Combs, an ingenious and learned Piece of Architecture; most of these Observations have been verify'd several Times, and fully evidenced. As for others, you may easily judge of them by the Manner they are related; we must be content with Conjectures, as not being able to attain to a perfect Knowledge of them, by reason of the Difficulties which occur in such Inquiries: For here Nature is not only encompassed with Obscurities, as it is every where; but she has also arm'd against us, when we would look near into her, the Stings of the Bees, which renders them intractable.

of

Of Bees, and their different Species.

THE Numbers of Bees in a Hive differ according to the different Sizes of the Hives; we reckon there are eight or ten thousand Bees in a small one, and about eighteen thousand in a large one.

We have found three different Sorts of Bees in every Hive, whether great or small: The first Sort is that we properly call Bees, which makes up in a Manner the whole Swarm: These are the Animals, as we shall shew by and by, that gather the Wax from the Flowers, that work it, and make Honey-Combs and Cells of it; 'tis they that gather the Honey, and fill the Combs therewith in Summer Time, to maintain them in Winter; who take care to supply their Young with Food suitable to their Age, and excite a Heat, which contributes to bring them to their full Growth; lastly, these are the Creatures, whose Business it is to keep the Hive clean, and to drive away whatever may be injurious to them. All these Bees have a Sting; and of this Species, there are some that are a little bigger than others.

The second Sort is what they call Drones; their Colour which is a little darker, and their Bigness will help you easily to distinguish them from others; for the Drones are one third longer, and a little thicker than the Bees. Some Hives have but a small Number of Drones, others have many; and there are some Seasons of

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of the Year, when we could discern none of them: We have likewise sometimes found Drones no bigger than the common Bees; no Drone has a Sting.

Finally, We have observed a third Sort of Bees in the same Hive, that are even longer than the Drones, but not so thick in Proportion to their Length, and they have a more lively and redder Colour; we never found above three of these in a Hive, and often but one: This Bée has a grave and composed Gate, and is arm'd with a Sting; she is the Mother of all the rest, as we shall shew hereafter, but is generally stiled the King Bee.



Description of a Bee.

YOU may distinguish three principal Parts in a Bee; the Head, which by a small Fibre adheres to the rest of the Body; the Middle of the Body, which is the second Part; and that is also distinguished from the Belly, which is the third Part.

Bees have two Kinds of Saws or Jaws in the lower Part of the Head, which open and shut from the Right to the Left; its with this Organ they gather the Wax, knead it, build and polish their Cells; they also use it to carry whatever they have into, and out of their Hives.

• At the same End of the Head, Bees have a Trump, whose Origin is near the Neck; it grows smaller and smaller from the Root, and ends

ends in a Point. This Organ consists of five Branches, whereof two are separated from the rest from their Roots, on the Right and Left; the other Three are not divided from one another till towards the Middle of the Trump; the middlemost is of a cylindrical Form, and as thick as a Hair, and being view'd with a Microscope, seems all along to be divided into several Rings, each of which is furnished with a great Number of small Hairs, which are longer towards the End of the Trump, than at the Root. This part, which we properly call the Trump, is one of the chiefest Organs Bees are endow'd with; for with it they gather Honey and Food from Flowers, as we shall observe by and by.

The other four Organs are longer towards their Origin, and grow smaller and smaller till they end in a Point: They are form'd like Gutters, being Concave on that Side which embraces the Trunk, and Convex on the other; they are of a horny Substance: The two Branches, which are separated nearer the Root, are longer, and embrace the other two; they join so well together, that they seem to be but one Pipe.

We are certain from repeated Observations, that the Bees gather their Honey with their Trump alone, and this Organ appears to us to be a Chancel into which the Honey may pass. We have likewise seen the Trump of the Bees grow bigger or lesser by Turns, bigger at the very Instant the Bee sucks the Honey; and as this Increase and Diminution happens successively from its Point to the very Root, this made us conclude, that the mellifick

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sick Juice causes that Swelling, as it passes into the Cavity of the Pipe: But it may also be supposed, that the Trump from the middle is as it were the Tongue, and that the Branches which encompass it assist in the Office of gathering Honey: The Tongue, after having gather'd the Honey from the Flowers, sends it thro' the Branches as far as their Roots, where it enters into the Body of the Bee, thro' which they are wont also to discharge it. These are the chief Parts of the Head, and their Uses, so far as the smallness of them will allow us to know 'em.

The middle Part of a Bee's Body is of a spheroidical Form, a little extended, to which two Wings are fasten'd, one on the right and the other on the left, a little above the Horizontal Line, which passes thro' the middle of the Body; each of these Wings has another, which seems to adhere to it, and is a little smaller than the first, which lies next the Head: It is with these four Wings they make their humming Noise, as a Signal to each other.

It is also on this Part of the Body, towards the lower end, that they have six Legs, viz. three on each side; two of these Legs are near the Head, and are the smallest of the six; the other four are fasten'd behind to the side of the Belly, and very near one another; the two middlemost are somewhat longer than the first, and shorter than the Hindmost: All these Legs have several Joints, of which there are three that are bigger than the others. Besides these three Joints which are towards the Middle of the Leg, there are others towards its
Root,

Root, and the end of each Leg; the Joint in the Middle of both the Hind Legs is much larger than the others, and we may observe on the outer side a small Cavity, like the hollow of a Spoon, surrounded with a great many small Hairs; it is in this Cavity that the Bees deposit by degrees the Particles of Wax which they gather from the Flowers of Plants as aforesaid: But we must take Notice, that the Legs or Thighs of the Drones, and of the Queen of the Bees, who gather no Wax, have not this Cavity.

The Ends of the Legs terminate with two sorts of Hooks back to back, with which the Bees fasten themselves together on the sides of the Hive, and form divers Figures, as one while a *Cone*, another time a *Plane*, and sometimes a *Festoon*; from the midst of these two Hooks a small and slender Appendix arises, which is sometimes folded and sometimes extended; 'tis very slender and roundish: Bees make use of this Part to fasten themselves to, and to walk upon polish'd Things as upon Glass: I am also of Opinion, they make use of this Part to gather the small Parts of Wax from the Flowers, and convey them from Hand to Hand to the hind Legs.

The last Part of a Bee is the Belly, and is distinguish'd into six Rings: We have observ'd two Parts in the inner side, one of which is a Bladder, wherein the Bees deposit the Honey which they suck from the Cup or Calyx of the Flowers, after it has passed thro' the Trump, and a very narrow Chanel that traverses the Head and Breast of the Bee: This little Bladder, when it is full, is about the

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the bigness of a small Pea ; it is so transparent that you may see the Colour of the Honey through it.

The other remarkable Part is the Sting, which is at the entering Part of the Bee's Belly, and shoots in and out very readily, by the Means of some Muscles placed very near the Sting ; this Sting is about the sixth Part of an Inch in length, and is somewhat thicker towards the Root than towards the end, which terminates in a sharp Point : It's of a horny Consistence, hollow within like a Pipe, thro' which a venomous Liquor passes, which being contain'd in a Bladder within the Belly, and a little distant from the Root of the Sting, comes out near its Point, and insinuates it self into the Wound at the same time that the Bee penetrates the Skin.

The Bee commonly leaves the Sting in the Wound, and the Sting drags the Bladder along with it, and sometimes part of the Insect's Guts : If the Sting be presently taken out of the Wound, it will swell but a little, because it does not give the Poison proceeding from the Bladder time to insinuate it self into the Wound : But if we are not nimble in taking it out, all the Venom will soon get into the Blood, and cause a great Swelling and Pain, that sometimes lasts for several Days. But here I shall take the Liberty to insert the excellent Mr. *Derham's* Observations upon the Sting of a Bee, for the Satisfaction of my Reader.

The Sting of a Wasp or Bee is so pretty a Piece of Work, that it is worth taking Notice of ; some have observ'd it to be as hollow

low Tube with a Bag of sharp penetrating Juices (its Poison) joyn'd to the end of it, with the Body of the Wasp or Bee, which is in stinging injected into the Flesh through the Tube. But there are, besides this, two small sharp bearded Spears lying within this Tube or Sting as in a Sheath. In a Wasp's Sting Mr. *Derham* counted eight Beards on the side of each Spear, somewhat like the Beards of Fish-Hooks : These Spears in the Sting or Sheath lie one with its Point a little before that of the other, as is represented in the Figure X, to be ready to be first darted into the Flesh ; which being once fix'd by means of its foremost Beard, the other then strikes in too, and so they alternately strike in deeper and deeper, their Beards taking more and more hold in the Flesh : After which the Sheath or Sting follows to convey the Poison into the Wound ; and that it may pierce the better, it is drawn to a Point, with a small slit at the bottom of the Point, for the two Spears to come out at. By means of this Mechanism of the Sting it is, that when the Sting is out of the Body, and is parted from it, it is able to pierce and sting us ; and by means of the Beard's being lodg'd deep in the Flesh, it comes to pass that Bees leave their Stings behind them, when they are disturb'd before they have Time to withdraw their Spears into their Scabbard. In Fig. X we may observe the two Spears as they lie in the Sting.

Fig. Y represents the two Spears, when squeez'd out of the Sting or Scabbard, in which Fig. A C B is the Sting ; c. d, and b. e. the two bearded Spears thrust out.

Of

*Of the Cells, and the Structure of the
Honeycomb.*

ON E of the first Things Bees go upon, after a new Swarm is put into a Hive, is to form their Cells; they apply themselves with so much Diligence to this Work, that we have seen them make a Honeycomb in one Day of a Foot long and six Inches broad; and which, according to the usual Bigness of the Cells, might contain near four thousand Bees.

They begin their Work by fastening it to that which is most solid in the upper part of the Hive, and they continue it from the Top to the Bottom, and from one Side to the other; and that they may fix it with the more Solidity, they sometimes make use of such a temper'd Wax as is almost like Glue.

It's not easy to account for the Manner how they carry on this Work, by reason of the Number of the Bees, which are in a grand Motion, and seemingly in Confusion; however, we have been able to make the following Remarks. We have seen each Bee carry a small Bit of Wax between their Chaps, and hasten to the Place of Business where the Combs were forming, and where they, by the Help of their Jaws, fasten'd the Wax, one while on the Right, and at other times on the Left, to their Work, about which each

Q

Bee

Bee spent but a short time, and then went their ways; but there is so great a Number of them that succeed one another in their Works, and with so much Celerity, that you will find the Honeycomb encrease sensibly enough. As some of the Bees work upon the Cells, there are others that go backwards and forwards in the framing Cells, and beat the same with their hind Parts, seemingly in order to make it solid and more firm.

The Order they observe in building the Cells is this: They begin with forming the Basis, which consists of three Rhombs or Lozenges; they presently make one of these Rhombs, and trace two Planes on each side of this Rhomb; they add a second Rhomb to the first, with something of a Declivity, as we shall observe hereafter, and trace two new Planes on each side of this Rhomb: Finally, they add a third to the two former, and raise two other Planes on both the Outfides of this Rhomb, which with the other Four form the Cell; and by this Disposition of the Basis necessarily becomes an Hexagon.

While some of the Bees are employ'd in building the Cells, others apply themselves to finish those that are newly traced, which they do with their Jaws, with which they smooth the Angles diligently, and finish the Sides and Basis with so much Delicacy, that three or four of these Sides being laid upon one another, are no thicker than an ordinary Sheet of Paper; and forasmuch as the Holes thro' which the Bees go in and out of the Cells, for which there is but just Room for them, would be too brittle, and easy to be broken, by reason
 Bee of

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of that Thinness, they strengthen each of them with a Welt of Wax.

We have observ'd, that those Bees which build the Cells, generally work but a short time together upon them; but it is not so with those that polish them, for they continue long at it, and yet use much Expedition, without ceasing from their Labour any longer than while they carry out of the Cells those little Bits of Wax which they have taken off in polishing; and to the end, that this Stuff may not be lost, there are other Bees ready to receive it of those that polish the Work, or come to take it out of the Cell, out of which those who are employ'd in polishing readily withdraw, and go to work in another Place.

There are other Bees appointed to assist those that are employ'd in polishing; for we find them often giving out either Honey or some other Liquor needful, either for their Work or their own Sustenance.

Each Honeycomb has two Rows of Cells opposite to one another, with their Bases in common; and each Honeycomb is somewhat less than an Inch thick; thus the Depth of each Cell will be somewhat more than the third part of an Inch: We have found in several Honeycombs of a Foot long, from sixty to sixty six Rows of Cells; each of them therefore must be a little more than the sixth part of an Inch wide, which is about a third of its whole Length.

The Honeycombs are almost all built of this Bigness, except a small Number of others in some Parts of the Hive, which are larger; these Cells are somewhat more than the fourth

part of an Inch wide, and about half an Inch long : These great Cells are made to deposit the Worms in, which change to Drones, as we shall shew hereafter.

Moreover, we find in several Parts of the Hive three or four Cells bigger than the former, and made differently from them ; they are of a spheroidical Form, open in the nether Part, and fasten'd to the Ends of the Honeycombs : We do not certainly know the Use of them, but they are suppos'd to be the Arbours or Habitations of their Queens.

The Bases of all the Honeycombs are plac'd at such a distance from one another, that when the Cells are finish'd, there remains no more Space between one another, than is sufficient for two Bees to go a-breast : These Honeycombs are not continued from the Top to the Bottom, but are often interrupted ; and besides this, they have Openings at certain distances, that there may be an easier and shorter Communication between them.

After having explain'd the Manner of building the Cells, we come more particularly to consider the Structure of them.

Every Basis of a Cell is form'd by three Rhombs, that are almost equal and alike, which, pursuant to the Measures we have taken, have two obtuse Angles, each of one hundred and ten Degrees, and consequently two sharp ones of seventy Degrees each.

These three Rhombs lean one towards another, and are joyn'd together by the Sides which contain one of the obtuse Angles ; and by their Inclination form a mutual solid Angle, which, by reason the Rhombs are commonly equal,
meet

meet in the Axis, and are answerable to the middle of the Cell; the other six Sides of the same Rhombs, besides the three obtuse Angles, form also three other Angles by a mutual Inclination, where they join together by the two sharp Angles.

These same six Sides of the three Rhombs are so many Bases, on which the Bees raise their Planes, which form the six Sides of each Cell; each of these Sides is a Trapezium, which has a sharp Angle of seventy Degrees, another obtuse one of one hundred and ten Degrees, and the two Angles of the Trapeze, which are on the Side of the Opening or Entrance, are right Angles: We are to remark here, that the sharp Angle of the Trapeze is equal to the sharp Angle of the Basis; and the obtuse Angle of the same Rhomb, equal to the obtuse Angle of the Trapezium; the six Trapezes which form the six Sides of the Cell, touch one another two and two by the equal Sides, and are in such a manner joyn'd to the Rhombs, that the obtuse Angles of the Rhombs are contiguous to the obtuse Angles of the Trapezes, and the sharp Angles of the Trapezes to the like Angles of the Rhombs.

Now, in order to know the Connexion between them, and how the two opposite Rows of Cells are form'd, you must suppose several other Bases like the foregoing; that is, that they have three Rhombs with the same Angles, and that these Rhombs lean one towards another, as in the first Basis. You must then suppose, that these Bases are apply'd one to another in such a manner that the analogous Angles of the one are answerable to the An-

gles of the other. These Bases perfectly joyn together, or three Rhombs of three different Bases, by the Junction of two of these Bases with a third, form a Basis of a new Cell like the former, with this difference, that the Concavity of the solid Angle is turn'd towards the other Face of the Honeycomb, where another Row of Cells is form'd opposite to the former; and by the Junction of six Bases with a seventh, three new Bases are form'd, which have the Concavity of a solid Angle, turn'd also contrary to that of the seven Bases: In like manner, by the Application of twelve new Bases to the other eight, other nine Bases are form'd, with the Concavity of the Angle turn'd opposite to the twelve; it is by this admirable Contrivance that the two Rows of Cells are form'd in the two Faces of the Honeycomb.

There are by this Method of building three Rows of Rhombs in three different Planes, so well pursued, that several Thousands of Rhombs of the same Order are found to be all exact in the same Plane: Thus indeed it is astonishing, that several Thousands of Animals should, by Instinct of Nature only, concur to make so difficult a Work with so much Order and Regularity.

We are, in the next place, to consider the Consequence of such a Fabrick. It has been observ'd already, that each Basis has three Rhombs, and that there is a Plane on each Side of these three Rhombs, which serves for a Side to an opposite Cell: But, besides this Use of the three Planes, they also serve for a Prop and Support to the Basis of the opposite Cell, and supply what might be deficient by

by reason of the great Delicacy of the Work. Secondly, The Concavity of the solid Angle, which is in the middle of the Basis, serves by an admirable Provision of Nature, to keep close together the Particles of Honey in a small Space, which the Bees daily supply the small Worm with for his Food, and with which he is daily encompassed after he is deposited there, as we shall shew in another Place; the Honey, which is liquid when it is gather'd, might, without such a Disposition of the Basis, run off, and so abandoning the Embrio, destroy it.

Besides these Advantages which arise from the Form of the Side of the Basis, there are also others which depend upon the Number of the Angles of the Rhombs: It is upon their Bigness that that of the Angles of the Trapezes has its Dependence, which form the six Sides of the Cell; but finding that the sharp Angles are seventy Degrees thirty two Minutes, and the obtuse ones one hundred and nine, and twenty eight Minutes; those of the Trapezes, which are contiguous to them, ought also to be of the same Bigness: Moreover, the solid Angle of the Basis is by this Bigness of the Angle of the Rhombs equal to each of the three solid Angles form'd by the obtuse Angle of the Rhomb, with the two obtuse ones of the Trapezes; from this Bigness of the Angles there results not only a greater Facility and Simplicity in the Structure, but a more beautiful Symmetry from the Disposition and Form of the Cell.

Finally, The Bees make their Cells of a regular Hexagon, by a kind of Skill in Geome-

try, as *Pappus* a famous Geometrician of the second Century has observ'd : There is that Property in this Figure, that if you place several of them near one another, they fill up a Space round the same Point, without leaving any Vacuity between one Figure and another. There are two other Figures that have the same Advantage, and those are the Equilateral Triangle and the Square ; however, they have not the same Capacioufness as the Hexagon.

It is therefore with Wisdom, that the Bees, according to the Opinion of the said Mathematician, prefer the Hexagon before other Figures, as it contains a greater Quantity of Honey in it than the Triangle or Square would do,

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Of the Generation of Bees.

THE Bee which they call the King or Queen, is the Parent of all the rest ; she is so fruitful, that as far as we are able to judge, she produces eight or ten thousand young ones in one Year, for she is usually alone in the Hive one Part of the Year ; and the Hive towards the end of the Summer is as full of Bees as in the beginning of the Spring : In the mean time one Swarm goes out every Year, and sometimes two or three, each of them consisting of ten or twelve thousand Bees.

The Queen, for the most part, remains concealed in the inner Part of the Hive, and is
not

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not to be seen but when she deposits her Young in the Comb, which are exposed to Sight.

It is upon these singular Occasions, that we have been able to discern her, tho' she is not always to be seen; for we find then a great Number of Bees fastned to one another, and form a kind of a Veil from the Top to the Bottom of the Hive; so that they interrupt our Sight, and do not remove thence till the Queen has laid the Young.

When she appears in Publick, she is always attended with ten or a dozen Bees of a larger Size than ordinary, who are as it were her Retinue, and follow her wherever she goes, with a composed and very grave Gate. Before she lays her Young, she puts her Head for a Moment into the Cell, where she designs to deposit them; if the Cell be found to be empty, and has in it neither Honey, Wax, nor any Embrio, the Bee immediately turns about, and thrusts the hinder Part of its Body so far as to touch even the Bottom of the Cell: The Bees which attend her, at the same time, stand round about her, with their Heads turn'd towards her, caress her with their Trumps and Legs, and make her a kind of a Feast, which lasts but for a very little while; after which she comes out of the Cell; and we may then perceive a small white and very slender Egg, about the four and twentieth Part of an Inch, or a little more in Length, and four or five Times as long as it is thick, a little more sharp-pointed at one End than at the other, with the thickest End set upon the Basis in the solid Angle of the Cell. This Egg is form'd by
a thin,

a thin, white and smooth Membrane, which is full of a whitish Liquor.

The great Bee immediately after she has laid an Egg in one Cell, passes with all the same Circumstances, and with the same Number of Attendants, to lay another in a Neighbouring Cell; and we have observed her, in this manner, to lay eight or ten in different Cells, immediately after one another, and it may easily produce a greater Number; she retires after she has done laying, accompany'd with the same Bees into the inner Part of the Hive, and we see no more of her.

The Egg, which lies in the Bottom of the Cell, continues for four Days in the same Condition, without any Alteration as to Form, or Situation: But upon the Expiration of that Time, we find it changed into a Maggot, whose Body is jointed in several Rings, and is folded up in such a manner, that the two Ends touch one another. It's then encompassed with a little Liquor, which the Bees at the four Days end place at the solid Angle of the Basis. What the Nature of this Liquor is cannot be known, by reason of the Smallness of its Quantity; and so we remain in doubt whether the same be Honey, carry'd thither by the Bees, for the Nutriment of the Embrio; or some other Matter proper to fructify the Sperm; for it appears to us to be more whitish, and not so liquid and transparent as Honey.

But of what Nature soever this first Liquor may be, wherewith the small Worm is encompassed, it's certain that the Bees afterwards carry Honey for its Nourishment, and they bring them a greater Quantity of Food in Proportion
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to their Growth, till the eighth Day, when they augment it so much, that it takes up the whole Breadth of the Cell, and great part of its Length: After which the Bees take no further Care of these young ones, but stop up all the Cells which contain those Worms. After the stopping of the Cells the Worms remain twelve Days longer, during which the Embrio's undergo divers Changes, which we have discover'd by opening those Cells on different Days from the Time they were stop't up. First, the Worms change their Situation, and instead of the Foldings that were before on the Basis of the Cell, they extend themselves in Length, and place their Heads towards the Mouth of the Cell; the Worm's Head is a little unfolded, and we may then begin to see some small Lengthenings, which, in my Opinion, are the first Beginnings of the Trump; a black Point may also be seen upon the Front of the Head, and at a little distance from it a black Streak upon the Back, which does not reach to the Extre'mity of the Worm: You may, in like manner, discern the first Lineaments of the Legs but very small.

When the Head is form'd, and the Trump extended, all the other Parts come afterwards to appear; insomuch that the Worm becomes wing'd, and grows by degrees a perfect Bee, except only that she is white and soft, and has not that kind of cru'sted Skin with which she is afterwards cover'd.

The Worm, by this Transformation, divests her self of a white and very fine Skin, which sticks so exactly to the inner Sides of the Cell, that it assumes the same Figure of Angles,

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Angles, as well at the Basis as on the Sides, and seems to be but the same Body.

The Bee being divested of this Pellicle, has six Legs rang'd upon her Body, from towards the Head to the hind Part of the Body, where the hindermost are. The Trump, with its quaternal Covering, is situated in its full Length in the midst of the six Legs, from the Head almost to the extream Parts of the Body: The Wings lie along the two hind Legs on the Side of the Belly; they are not then at their full Extent, but in several Folds.

The Bee being in this Condition, there are several Parts of her Body that change Colour one after another. The Eyes at first are of a dark yellow, but they afterwards become of a violet Colour, and at last black. The three Points which form a Triangle with equal Shanks on the Top of the Head, are afterwards found to be of the same dark yellow, and then changing as the Eyes do, at last become black. The Ends of the Wings are ting'd with a dark Colour. The Horns are equally divided into two by Joints; and undergo a Change, first that which is farthest from the Head, and then the nighest to it. The Trump and the Legs appear at the same time of a Chestnut Colour. The whole Head, as well as the Breast, from a bright Earth Colour, becomes gradually darker. The Wings explain themselves, and extend to their natural Length. We also begin to observe the Hair which covers the Bees, and is form'd and dispos'd upon the Head, Breast, and the rest of the Body, in a very agreeable manner.

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The Bee, after having undergone all these Changes, becoming a perfect Insect, from the twentieth Day of her Age, endeavours to get out of her Cell; she makes then a round Hole with her Jaws in the Cover that stop't it. When the Bee is advanc'd thus far as to quit the Cell, it seems drowsy, but quickly assumes her natural Agility; for she may the same Day be seen coming out of the Hive, and returning from the Fields laden with Wax like the rest: You may distinguish these young ones by their Colour, which is a little darker than the old ones, and by their Hairs, which are more whitish.

After the young Bee has made her Passage out of the Cell, two other Bees go thither presently; one of which takes away the Cover, and it chips and uses the Wax, which it was made of elsewhere, the other is employ'd in refitting the Opening: For the young one having left it round or unequal, when she made her Way out, this same Bee puts it into its first hexagonal Form, strengthens it with the usual Border, and clears it of the little Pellicles left by the young Bee, which perhaps are the Off-castings of the Shanks; for as to that new Pellicle which encloses her whole Body before she leaves the Cell, we are of Opinion, it sticks, like the other before mention'd, to the inner Sides of the Cell: These Pellicles so sticking to the Cells, make them change Colour, and hence it is that we find Honeycombs in one Hive of a different Colour: Those wherein there has been nothing but Honey being of a bright Yellow, and those out of which the young Bees come of a dark Yellow;

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we have sometimes pull'd off from a Cell, which has been the Cradle of several Bees, no less than eight of these Pellicles: one within another. When the Cell is brought to its former State, the Bees sometimes the same Day lay new Eggs therein: they now and then put in Honey first. We have seen Bees lay their Young in the same Cells at five different times within the Compass of three Months.



How Bees gather Wax.

BEES gather two sorts of Wax that are different from one another; the first, which is brown and glowy, serves to stop up all the Holes in the Hive, and sometimes to stick the Honeycombs to the Hive; the other sort is the ordinary Wax they make use of in building their Cells.

Bees gather common Wax from the Leaves of a great many Trees and Plants, and from all Flowers that have Chives or Apices; they gather a great Quantity from the Flowers of Rocket, and especially from those of the common Poppy, which have Plenty of these Chives; they often have their full Load before they get out of one of these Flowers; but they are so prodigiously nimble at their Work, that how attentive soever you may be in observing them, it's with much Difficulty your Eyes can follow them, and that you are able to find out the Way they take the Dust from the Flowers:

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Flowers : It is indeed certain, that they sometimes gather the Wax with the Hairs which cover their Bodies, which they roll upon the Flowers; for they may be seen returning out of the Fields with their Hairs full of small Particles of Wax like Dust, but this comes to pass only when the Mornings are moist; the Humidity which is then upon the Flowers being perhaps the Cause why these Particles cannot so easily be put together in that Part of their Bodies where they are wont to deposit them; but when they are got into the Hive, the Warmth therein causing the Moisture to evaporate, they can the more easily gather the Wax with their Feet, by stroking their Hairs several times with them.

They often gather the Wax with their Chaps and two fore Legs; from these they convey them to the middlemost, and thence afterwards to the Joint in the middle of the two hinder Legs, where at last it is found gather'd together to about the bigness, and in the shape of small Lentils. This Joint is larger than the others, and has a small Cavity like that of a Spoon: Again, this Concavity is encompassed with small Hairs, which serve to keep the Wax in its Place, to the end it may not fall off when the Bees return to the Hive.

Besides these usual Parts which Nature has furnish'd them with, they likewise use a wise Precaution, that they may not lose the Fruit of their Labour: As the Bees convey the Particles of Wax to the hind Legs, they squeeze them together; and this they do by the Help of the two middle Legs, which they turn backwards, and apply them several Times, and in
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different Ways, upon the Wax, in the same manner as we are wont with both Hands to squeeze such Particles as we have a Mind to press together. These are chiefly their Occupations and Cares; when being laden with a sufficient Quantity of Wax, they are ready to take the Wing, and return to the Hive; and if the Flowers upon which they alight are agitated by the Wind, they seek out a more quiet Place, and such as is more proper to shelter them from the stormy Motion of the Air.

When the Bees are got into the Hive, they disburden themselves of the common Wax two different Ways; for resting upon their two fore Legs, they make several Motions with their Wings and Bodies, sometimes to the Right, and at other times to the Left; and, as if this Motion and Noise were made on Purpose to give Notice to their Companions, three or four of them come and take each a small Quantity of the Wax with their Jaws; after which come several others, who take their share of the Lading till no more remains, and then they return into the Fields for a new Harvest.

This is also the Way they disburden themselves of the other sort of Wax, or rather Glue, which sticks so fast to the Bee's Thighs, that both those that come to take it off, and the others that are laden with it, are oblig'd to use their utmost Efforts on both sides to get it off.

But when the Hive has a great many Cells, they use a more ready and expeditious Way, and such as stands in need of no Help to get rid

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rid of the common Wax. The laden Bee finds out a Cell where is neither Honey nor any Worm, and then with her two fore Feet fastning her self to the upper Edge of the Cell, she afterwards folds her Body a little forward, in order to put her two hind Legs into the Cell. In this Posture she turns the two middle Legs backwards, and so slipping them from the Top to the Bottom along the two hind Legs, where the two Lentils, like Bodies of the Wax, are lodged, she loosens them by this Means, and leaves them in the Cell.

There are some that content themselves with letting the Wax thus drop into the Cell, without taking the Pains to put it into order; but most of them go into the Cell, and very dexterously dispose the two little Bodies of Wax above mention'd, so that they may lie by the Side of one another in the Bottom of the Cell, and then withdraw.

Another Bee presently succeeds the former, out of those that attend, from the Arrival of the laden Bee at the Cell, where it discharges the Wax, and these Attendants by turns carry on the Work: If the two Bits of Wax are not placed as aforesaid, they carry 'em into the Bottom of the Hive, and temper them with their two Jaws for half a quarter of an Hour; insomuch, that when the Bee withdraws, those two small Bodies of Wax are reduc'd into the Consistence of a Paste; which gives us Cause to think that the Bees, in tempering the Wax, mix some Liquor therewith, either Honey or some simple Moisture proceeding from the Place from which they are wont to discharge

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the Honey, and with which the Bladder was perhaps fill'd.

Several other Bees come in the same manner to unload in the same Cell; and as one goes, another comes on, to temper the Wax, till the Hive is almost full of this sort of Wax, placed sometimes in Lays of divers Colours, as whitish, yellow, red, and brown, according to the Flowers or Leaves from which the Wax has been gather'd by different Bees.

We find in several Parts of the Hive a great Number of Cells full of this Wax, and they are, as it were, the Magazines to which they have Recourse upon Occasion; for as it is their Business for a great Part of the Year on certain Days to cover the Cells, wherein their Young are enclos'd, and to stop up those that are full of Honey, it's necessary they should have a Store by 'em for that Purpose.

The Wax which is found in the Cells, is not yet so perfect as that of which the Honeycombs are form'd; for tho' the first be temper'd with some Moisture, yet, if you press it between your Fingers, you may reduce it to Dust, whereas the other Wax is a kind of thicken'd Paste; the Bees therefore, before they use it in the building of their Honeycombs, must fit it for that Purpose; and that which likewise induces us to believe it, is, that the Wax in the Cells, which is at first of different Colours, is always White immediately after the Honeycombs are built.



Of the gathering of Honey.

B E E S gather Honey from those Flowers whose Calices are no deeper than the Length of their Trumps : But each Flower contains so little Honey, that they touch upon a great many before they get together a sufficient Quantity to fill the small Bladder that is the Receptacle for it, as we said in the Beginning of this Discourse. As soon as the Bees alight upon a Flower, they extend their Trump, and convey it to the Bottom of the Cup or Calyx, where they suck the Honey ; but when they find the Bladder is full, they return to the Hive, and carry the Honey into a Cell, where they discharge it by that Part of the Head situate between the two Jaws, which they extend more than usual, and keep but a little open : They deposit the Honey by moving their Heads sometimes on one side, and sometimes on the other ; and when they find a Drop happens to be ill placed, they extend the Trump to take it up, and then order it in the same manner as the rest, by discharging it as before from that Part of the Head that is between the Jaws. As the Honey which one Bee carries at a time, is but a small Portion of that which the Cell can con-

tain, the Honey gather'd by a great many Bees must go to fill it.

When the Cells are full of Honey, they stop up those they reserve for their Winter Store, with a very thin Wax Cover; but those Cells which contain Honey for their daily Food, are open, and at the Disposal of the whole Swarm. That Honey which is to be used last for their Sustenance, is always put into the most inaccessible Place, that is, in the upper Part of the Hive, if it has no Lid that can be taken up; but if it has one, they leave empty Honeycombs in the upper Part, and deposit the Honey in the middle of the Hive.



Of several other Particulars concerning Bees.

BESIDES what we have already observ'd concerning Bees, Nature has endow'd them with other Talents, which we judge to be worth remarking. They love Property, and there is nothing they will not undertake to preserve it. They use the Glue which they gather, to masticate the Glasses round the Hive, and even the Hive it self round the Foot-stall, so that they can by this Means hinder the least Insects to get in.

There are Bees that watch the Mouth or Entrance of the Hive, to oppose those Insects that

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that would get in that Way ; and when one Bee is not strong enough, several others come in to her Assistance.

It would be too tedious to recount all the Remarkables we have observ'd upon this Occasion ; let it suffice that a Snail, which forced her Way into the Hive, notwithstanding the Efforts of several Bees, after they had killed her with their Stings, was found cover'd all over with this Mastick or Glue, as if they design'd thereby either to hinder the Stink her Flesh might make in the Hive, or to hinder the Production of Worms from the Putrefaction.

Nature has furnish'd Bees with a most exquisite Smell, for they will scent the Honey and Wax at a great Distance.

They have divers Ways that would make a Man apt to believe that they have Understanding ; they are also subject to fight and kill one another, not only in a single Combat, but in a Body ; which yet does not usually happen, unless it be in the Autumn, when the Stock of Honey is not enough to support the whole Swarm during the Winter.

They seem to have some Knowledge of good and bad Weather : For they not only keep within when there is any likelihood of bad Weather, but when any Storm happens when they are abroad, they avoid it by quitting their Work, and returning to the Hive almost all together, and with much Precipitation ; they do the same when they are surpriz'd in the Fields by some Rain, tho' but little.

Nothing agrees better than Heat with Bees, the more Intense it is, the more they are animated to, and the more active at, their Work; Cold, on the contrary, is very injurious to them: And let them be never so vigorous when they are in the Hive, if they go out of it in Winter-time, they are so seiz'd therewith, that they appear to be almost immediately motionless; but if you do not delay to bring them near a Fire, the Heat it yields will restore them to their former Vigour.

To fortify themselves against Cold in the Winter-Season, they place themselves in the Middle of the Hive, as near one another as they can, in that Space which lies between two Honeycombs; there they agitate their Bodies from time to time without changing Place, and this Motion excites a Heat, which secures them from external Cold, and is often so considerable, that it is communicated to the Glasses of the Hive. It's likely, that they succeed one another in this Work, for there is a continued Motion, Night and Day, in the Hive; and there are some of them which take their Rest in the Day-time: And this Rest even conduces to the Benefit of the Publick, for their Presence in the Hive helps the Heat, by the Means of which the young ones inclos'd in the Cells are hatch'd; which we have found true by the following Experiment.

We have sometimes taken off a Piece of a Honeycomb, in whose Cells there were young Worms, and left it in the Bottom of the Hive, and found a great Number of Bees sitting upon these Combs, where they continu'd till the young ones came out perfect Bees, after which they

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they wholly forsook the Combs ; this also shews the Care which the common Bees take of the Young.

We have taken Notice of the several Ways and Motions by which ~~they~~ ^{one} understand one another : For Example, when a Bee is at work upon the Combs, and requires Honey of another which brings it from abroad, she that wants the Honey extends her Trump, and takes it from between the other's Jaws ; and as the one discharges the Honey through that Part, the other receives it with her Trump without spilling a Drop ; they likewise understand one another, when by the Motion of their Wings they require to be disburden'd of the Wax which they have gather'd in the Fields, and also in the Morning they excite one another to go out to Work. Lastly, When several Bees have a mind to quit a Place, if one makes a Motion with her Wings that causes a small Sound, all the rest, according to her Example, make the same Motion, and retire : I believe this is the Way they give Notice to one another in the Hive, when they make ready to go forth and swarm.

*Of the Drones.*

THE Drones are usually one third thicker and longer than the Bees; they have a rounder Head, and are more thickly cover'd with Hair: It's certain they have no Sting, and that their inward Parts differ from those of common Bees.

They are seldom seen out of the Hives, and when they do go forth, it is about two or three in the Afternoon, and never but in fair Weather. They do not return laden with Wax, but we have found their Bladder full of Honey like the other Bees, which they have either gather'd in the Fields, or taken from the Hive before they set out, which last is most likely; for we could never see them alight upon the Flowers, neither after their Return to the Hive could we observe them deposit any Honey in the Cells. We are also of Opinion, that they are not furnish'd with Organs proper to discharge it, as the Bees are; for in Bees, if you squeeze that Part of the Body where the Honey-Bladder lies never so little, it will presently come out at that Part of the Head through which they are wont to discharge it into the Cell: But it is not so with the Drones; though after you have
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open'd them, you will find their Bladder full of Honey.

There are Hives wherein you have but few Drones, but there are a great many in others; they continue for part of the Summer dispers'd in the Hive: After which, as their Number encreases, they draw together in Troops in several parts of the Hive, where they continue cantoned, almost without making any Motion.

When the Swarm goes out, and all the Bees are in Motion, the Drones keep their Ståtion, and go not forth with the Swarm; or if they do, they are but a very few. But from the End of *July* to the Middle of *August*, these Drones are attack'd by the common Bees; and though the Drones are bold, and resist as long as they are able, yet they are at last forc'd to yield, and go out of the Hive, and we know not what becomes of them.

When this kind of Fight happens, you may see all these Animals in great Motion, as well without as within the Hive, much in the same manner as when they swarm: All these Drones are so universally expell'd, that of several Hundreds which we have often found in one Hive, we could not, by the End of *October*, discern one in the several Hives we search'd upon that Account.

We have in the Spring and Summer-time seen a great Number of small Worms in the Cells, tho' we could not find any Drones in the same Hive, notwithstanding all the Care we took to examine them.

They have the same Origin with that of Bees, and they proceed from the Queen, and
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are produc'd with the same Circumstances, except only that the Drones are bred in such large Cells of the Honeycombs as are made on Purpose for them.

It has been already observ'd, that a Hive has some Combs, whose Cells are one third or one half larger and longer than the common Cells. The Queen makes choice of these great Cells, in order to lay therein, (with all the Circumstances we have already noted concerning the common Bees) those Eggs which afterwards become Drones, and which you cannot by your Eye distinguish from the common Eggs: But it is likely that the Parent who produces them knows them, because she assigns them Habitations in Proportion to that Bigness they are to attain to in their full Growths. These Drones are subject to the same Changes we have related concerning Bees: They are as many Days before they come out of the Cells; they are stopt up the eighth Day after their Eggs are deposited in the Cells; but their Covers are much more raised, the more to lengthen the Cells, and to make them as long as the Drones.

Finally, They are fed with the same Care as the common Bees; but it is amazing, that that Attention and that Love which the Bees shew for these young ones, should be turn'd into so great a Hatred at the Expiration of the Summer: This Hatred is so universal, that they do not spare even the young Drones that are yet imperfect in the Cells; for we have seen several times, that when one Party of the Bees are driving the great Drones out of the Hive, there is another employ'd to
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open the Cells, where their imperfect Drones are lodg'd, in order to pull them out from thence, to kill them and convey them out of the Hive, where we have sometimes seen two or three Hundred kill'd of young and old.

~~THE CONFORMITY OF THE PARTS OF THE COMMON BEES AND DRONES~~

A Description of the inward Parts of the Drones.

THE Conformity there is between the inward Parts of the common Bees, more particularly as to the Head, Breast, and the Beginning or Fore-part of the Belly, and those same Parts in the Drones, is such, that we have not been able to discern any Difference between them; for the Trump and Breast, both of the one and the other, are much the same as to Bigness; and they have all of them a Bladder in the Belly, of a very delicate Con-texture, which is the Receptacle of the Honey; also the Intestines seem to be of the same Structure, except only the Parts situated at the Extremity of the Belly, which are very different from those of the Bees. We have observ'd before, that common Bees have in that Place a little Bladder full of a clear and transparent Liquor like Water, which is the Poison they discharge by the Sting, through which it passes, and comes out near the Point of it: But the Drones have neither Sting nor Bladder; they have in this Part of the Belly
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some other Parts that seem worthy to be taken notice of, and which perhaps will lead us to understand the End for which Nature has design'd them.

The Belly of the Drone, towards its hinder Parts, is divided into two unequal Parts, by a kind of a whitish and very thin Diaphragm ; that towards the Head is smaller, and the other towards the hinder Part larger, wherein those of the Intestines are contain'd ; which, on one Side, have a Communication with the Honey Bladder ; and which, after having formed several Foldings immediately under the Back, and round the Parts we are about to describe, terminate at the *Anus*.

We may observe four glandulous cylindrical Bodies under the Intestines, which are round at one End, each of them separately invested with a Membrane ; they are rang'd two and two upon one another ; the two lowermost are commonly the biggest, and are disunited, except at one End, where they join together in a Point, and both of them form one common and very narrow Channel : These two Bodies are about the third Part of an Inch long ; the other two Bodies are shorter and smaller, they are also cylindrical, and are join'd by a kind of Pellicle to the larger ones near the hind Parts, where the great ones join together.

Though these two Bodies are commonly smaller than the two former, yet we have also found them in different Drones to be often almost equal ; and in this Condition you will find all four of the same Colour, which is bright and somewhat inclining to yellow ; when the

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two lowermost are thicker than others, they then contain a liquid, glewy, and whitish Matter, which appears thro' the thin Coat which encloses it; but the uppermost always retain the Colour we have mention'd before.

If you press those two Vessels when full of this Matter, you will force it thro' the common Channel before mention'd, along which it passes to the hind Part, and so out of the Body of the Drone; but when these Bodies are not equally fill'd with this Matter, you cannot press out any Liquor at all.

This Channel in the Drone's Body is folded into several Plaits, but does not take up above a Quarter of an Inch space; tho' when it is unfolded, and at its full Length, it's about an Inch or somewhat more, and has all along different Conformations and Capacities: It's a very narrow cylindrical Channel at the Rise of it, about half an Inch long or a little more, of a very fine Texture, and easily broken; after which it grows considerably bigger to the Extent of a Quarter of an Inch; the first half of which retains the same fine and delicate Texture, but the other Part of this Channel is of a more remarkable Structure.

There are two Bodies that are almost triangular, equal, of a horny Consistence, thin, crooked, and of a dark-red Colour, which form part of this Channel; these we call Wings, because they somewhat resemble them: The two Sides of each of these Wings along the Channel, are somewhat different, and terminate in a very sharp Angle; the third Side following the Breadth of the same Channel, makes but about one third of the others; the two Wings
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lie almost back to back throughout the Length of the biggest of the Sides, and are not separated here any otherwise than by a small Space taken up by the Continuation of the common Channel which joins them together. These Wings are so well united to the Channel, that it may be said it is the Channel it self that is stiff; there is only one part of the sharpest Angle that is separated and embraces the Channel. Besides these two Wings which are of a horny Consistence, there are two others which are smaller by half, of the same Colour and Substance as the former, situate on the Side of each of the preceding ones; they arise in that part of the Channel which answers the Middle of the two first Wings, and terminate with them almost in the same Place: Those four Wings take up but a Part of the Compass of the Channel, the other being the Channel it self continued; but here it seems to be strengthened by some Muscular Fibres, which have their Origin in the same Place where the Channel grows wider, and terminate at the Ends of the Wings, which are indented, and to which these Fibres seem to be fastned.

The Channel is of the same Consistence as before, at the Extremity of these Wings, except that it is narrower and flatter; for it would appear larger, according to the horizontal and vertical Diameter. This Part of the Channel, which is no more than the twelfth part of an Inch about, terminates in a Bag, at the End of which there is a Figure resembling a double Cock's Comb; that is, it is a little hollow in the Middle, indented round, and admirably regular; the greatest Points being

being towards the End of the Bag, from whence they come diminishing on both Sides even to their Origin. There is a Communication between this Bag and the Channel; for in squeezing the Channel, the Matter contain'd therein enters into this Bag, passes thro' the Cock's Comb, fills all its Eminences, and at length goes out near the Hole of the Bag thro' which it went in; here seem'd to me to be a double Channel, one for the Matter to pass in, and the other to go out at.

The Continuation of the Channel immediately next the Bag, is of a stronger Consistence, and almost Muscular; this Part of the Channel is not above the eighth Part of an Inch in length, and it has all along on the Outside four Rings placed at equal Distances from each other. These Parts or Rings surround but one half of the Channel, and they are muscular, reddish, raised on the Outside, and thicker towards the Middle than the Ends.

On the opposite Side of the Channel, where these Parts of the Rings terminate, there is another Body of a horny Consistence and reddish Colour, which takes up but a small Part of the Circumference of the Channel; it is a kind of an Ellipsoid, raised up towards the Middle, and flat towards the Edges, and extends more in the Length than the Breadth of the Channel.

To help this Body on the same Side of the Channel where the Parts of the Rings are, there is also another reddish muscular Body, five or six times broader, and longer than the former: From these Bodies to the Right and Left arise two strait long Muscles, which are apply'd to
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the Channel long ways, and whose Ends unite with the Parts of the Rings above mention'd.

These same Bodies do not embrace the Channel throughout; but where they cease, there are two other muscular flat Bodies of a reddish Colour, that run along the Channel, and come out like two Ligaments, which are fastned to the lower part of the Belly, on the inner sides of the Crust which covers the Drone: Finally, the End of this Channel terminates in the Crust of the Drone, and ends in an Orifice, thro' which the Matter contain'd in the two Cylindrical Bodies is thrust out, after it has passed thro' all the Parts of the Channel we have been describing.

It often happens, when you hold Drones between two Fingers, without pressing them at all, that they will burst with a Noise; and that this Channel, with all its Parts, will come out at the *Anus*, which presently occasions their Death.

Tho' it is difficult for us to know exactly the Use of those Parts, we may however say, with some Probability, that they appear to have been form'd for Propagation; and as we are confident that the King, who may be easily distinguish'd from the Drones by his Size and Colour, is a Female, we may say that the Drones are Males.

Upon this Supposition of the four Cylindrical Bodies, of which we have spoke before, the two small ones inserted in the two biggest, may serve for Testicles, and the two biggest for Seminal Vessels, where the Liquor contain'd therein, and which is the Seminal Substance, is brought to Perfection; this Matter
coming

coming out of the two little Bladders that are between the long and the streight Channel, passes from thence into the large Channel, to which the four Wings are fastned.

It is easy to conceive, that when the two glandulous Bodies are fill'd with this Matter, that it glides and passes thro' the narrow Channel, and from thence into a bigger ; but that it may afterwards enter from this great Channel into a narrower, it's necessary that the Liquor should be compres'd ; the four Wings on the inner Sides of the large Channel coming near one another by the Means of the Fibres which are join'd to their Ends, may press this Matter on the great Channel, and cause it to pass into all the Parts of the Bag and Folds we have mention'd, which subtilizes and makes it more perfect ; those Parts of the four muscular Rings which below the Bag encompass'd some of the external Parts of the Channel, and whose Ends are fasten'd to the Longitudinal Muscles, may compress the Channel, and squeeze the Matter out of it. The two Muscles which come after may serve instead of a Sphincter, and close up the Channel ; the other two long Muscles, which are fix'd to the inner sides of the Drone, may perhaps be the former's Antagonist, and serve to open the same Channel, that the Matter may pass which teems or impregnates the Female's Eggs.

We have not hitherto been able to discover in what manner this Impregnation is brought about, whether it be in the Body of the Female, or after the way of Fishes, when the Female has spawn'd : The whitish Matter that encompasses the Egg in the Bottom of the Cell

S

soon

soon after it is laid, seems to carry it in favour of this last Opinion, as well as the Remark which has often been made concerning a great number of Eggs which have produc'd nothing in the bottom of the Cell, and about which no such Substance has been observ'd.

From some Observations made at different times, it has been conjectured, that Drones contribute nothing at all to the Generation of Bees; for, upon the Examination of several Hives, not only in the Autumn, after the Drones have been driven away by the Bees, but also in Summer-time, when we have found in the Hives a great many Eggs and young Bees enclos'd in the Cells, we met with no Drones. But by a late Observation we have made, there's room to believe, that there might be some Drones in those Hives, tho' we have not been able to distinguish them from amongst so many thousand Bees: But upon a more nice Enquiry, we have lately observ'd a great many Drones that are much smaller than those taken Notice of before, and which exceed not the Bigness of small Bees, insomuch that it would be no easy thing to distinguish them in the Hive from common Bees, without dissecting them, or very close Examination: It might very well be, that tho' we could find no large Drones in the Hive, that yet there might be some of these small ones intermix'd, and pass undistinguish'd amongst the rest of the Bees, since we knew not before that there were any of that Size.

All the Cells of the Hive, wherein these small Drones are found, were little, and there were no large Cells to be discover'd.

After

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After these Observations upon Bees and their Economy, it may be expected I should say something concerning their Hives, and the way of managing them ; both which I shall, in due time, be very particular in, as well as endeavour to shew the Profits that may arise from them ; but I shall only mention in this Place some few Heads which I shall enlarge upon hereafter ; as that, first, in regard to their Hives, they should be so contriv'd, that they may open into one another, which will give the Bees room to add to their Store when a plentiful Season of Flowers happens to be attended with proper Weather for their going abroad ; and likewise, that when we have a mind to take any of their Honey, we may avoid killing the Bees : The Hives I mean, are in some respects like the Box-hives, which are commonly made Hexangular.

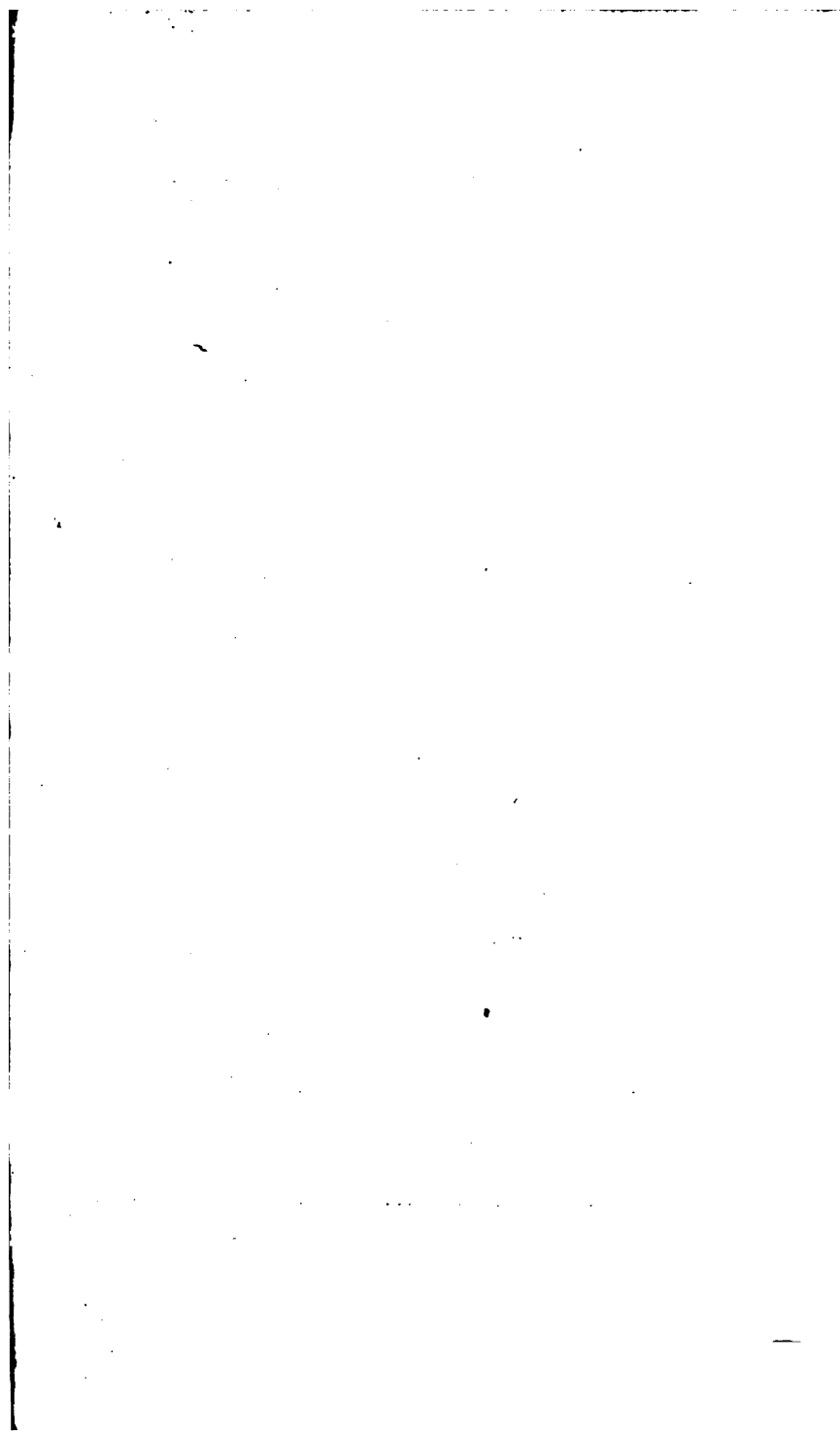
2. I shall have Occasion to treat of the Bee-house, wherein these Hives are to stand, of its Contrivance for Warmth in the Winter, and to prevent the Inconvenience of the Bees stinging or annoying the Person who takes the Honey ; and in which Place likewise we may see them at work without disturbing them.

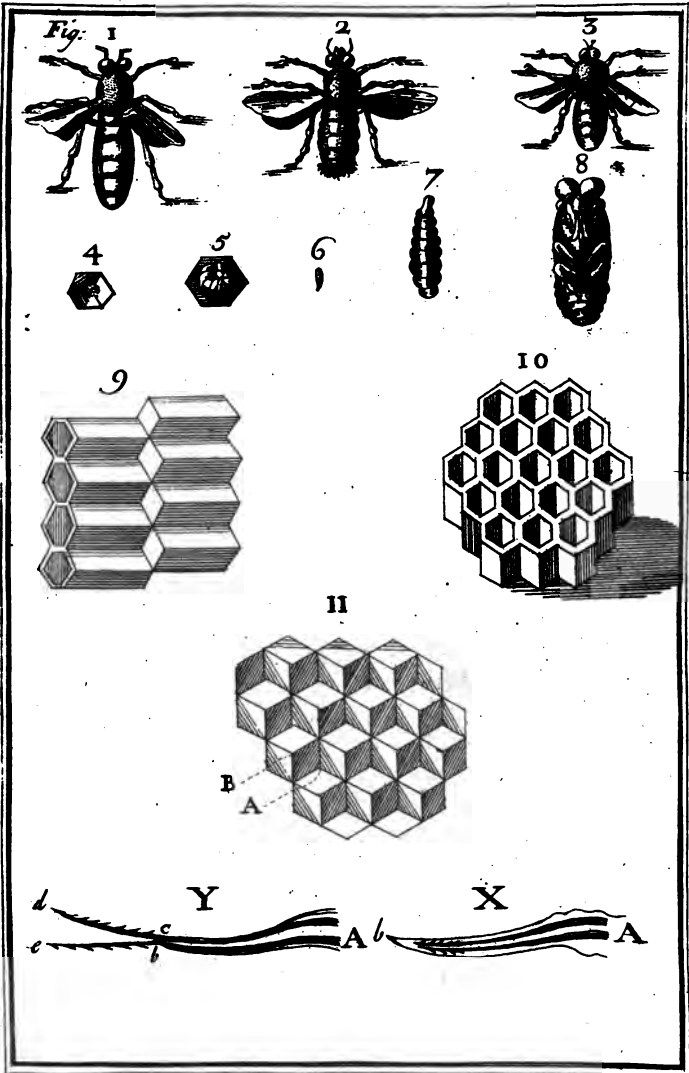
3. I shall give a List of those Plants and Flowers which they chiefly gather their Wax and Honey from, and the Seasons when such Plants blossom, that one may guess, by looking into their Hives, whether they may get sufficient Store for Winter, which we ought to enquire into very narrowly, lest we weaken our Stock. To this *Memorandum* I shall add what Things may be proper to feed them with, in

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case of bad Weather in their working Season, that we may help them betimes ; for if we find a Stock which begins to make fresh Combs at the End of Summer, we may be assur'd they are weak, and will not live the Winter through without timely Help ; even though they can go abroad, they must be assisted : And upon this Topick I have engag'd a Correspondence with some of the most curious Men in *England*.







THE EXPLANATION

*An Explanation of the Figures in the
Cut relating to Bees.*

Fig. 1. **T**HE Queen of the Bees, according
to her natural Size.

2. The Drone the same.

3. The Bee the same.

4. The Basis of the Cell in its Horizontal
Situation, that you may have the better Idea
of the Form of the Egg as soon as it is laid,
and in what Manner it is usually plac'd upon
the Basis.

5. The Basis of the Cell in its vertical and
natural Situation, with the Egg chang'd into a
Worm or Caterpillar, and encompassed with a
little Liquor four Days after it is hatch'd.

6. The Worm, according to its Growth
eight Days after it has been hatch'd.

7. The same Worm ten Days old, after it
has alter'd its Shape and Situation.

8. The same Worm chang'd into a young
Bee that is bigger than ordinary, that is yet
white and soft.

9. Part of the Honeycomb, which repre-
sents how the Cells are rang'd in the two op-
posite sides of the Comb.

10. A Piece of a Honeycomb, representing
the Cells on the Inside.

11. Several Cells whose Sides are taken a-
way, where we only see the Bases: This Fi-

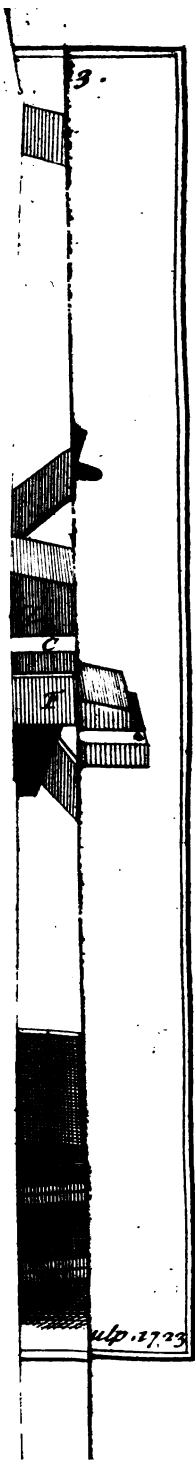
gure gives us to understand how these Bases are rang'd with respect to one another, and in what manner the two Orders of Cells are form'd in the two Faces of the Honeycomb : For the Angle A represents the solid concave Angle, which is at the Bottom of the Cell in one Face of the Comb. The Angle B and the rest of the same Order shew the solid Angle, which is convex in the same Face of the Comb, but concave in the opposite one, and found at the Bottom of the Cell opposite to the former.

X. The Sting of a Bee, according to Mr. *Derham*, F. R. S. in the Sheath.

Y. The Sting of the Bee out of the Sheath.









C H A P. XII.

Description of a Mill for making Cyder, with twelve Bushels of Apples to each Hogshead. Invented by Edmond Browne of Redborough, Esq; in Gloucestershire; and now in Practice among the Inhabitants of that Part of the County.

I Need say very little in Commendation of the above-mention'd curious Gentleman's Invention, for making an Hogshead of Cyder with twelve Bushels of Apples, since it is so well known, that the common Allowance of Apples for an Hogshead is twenty, and sometimes two and twenty Bushels; so that by this Method there is at least one third Part gain'd upon all the Cyder-Ground in *England*; which vast Improvement very justly demands the Thanks of every true Lover of his Country, to the worthy Inventor.

Explanation of the Mill for grinding Apples.

Fig. I. Represents the Binn or Trough where-into the Apples are pour'd, in order to their being tumbled down between the Rollers to

be ground. This Binn is furnish'd with a Tongue *a* that enters into the Box, *Fig. II.* the better to guide the Apples to the Rollers; and the Tongue is lodg'd upon a Rest, plac'd within at the Mouth of the Box, in such a manner as that the End of it may hang directly over the Top of the Roller *b*, *Fig. III.* but so as not to touch it; the Person that grinds at the Handle *e* of the Mill, *Fig. IV.* is with his left Hand to feed the Mill, and govern the Apples, that they may tumble into the Rollers in a just Proportion, and not choak.

Fig. II. Is a Box to be fasten'd down (by its Frame *A*) with Screws or Keys upon the Pieces *b* and *i* of the Mill, *Fig. IV.* to protect the Rollers and confine the Apples. The Top Board of this Box *g*, is to be furnish'd on the Inside with Teeth or Furrows, represented by the prick'd Indentings *k k*. The Use of these Furrows is to crush a larger siz'd Apple (at its Entrance) against the Roller *b*, *Fig. IV.* that it may not refuse to be taken in between the Rollers *b* and *c*. This Top Board should therefore be elevated, to such an Angle with the Frame of the Box, as that it may be at a proper Heighth from the Roller *b*; and also so near to the Roller *c*, as just not to touch it; thereby to prevent any Parts of the Apples from getting over and beyond the Roller *c*.

Fig. III. Represents a Roller drawn to a larger Scale, (with thirteen Teeth) the Diameter *l m* is seven Inches, the Thickness *l n* four Inches and a half. The Whole being of Cast-Brass or Bell-Metal, except a Cavity thro' it,

it, represented by the hexagonal Figure *o*, *p*, *q*, *r*, *s*, *t*. and which is fill'd up with Wood, wherein the Iron Axis *u u* is plac'd. The angular Figure of this Wood prevents its loosening or turning round within the Metal.

Fig. IV. Is the Mill join'd in all its Parts, wherein *a* is the Binn, supported behind by a Rest *w*; *z* is the Box screw'd on by its Frame *A*, to the Pieces *b* and *i*: If you suppose the Side of this Box transparent, the Rollers *b* and *c*, which are of equal Bigness, and represented by dotted Lines, will be seen thro' it. The Roller *b*, turn'd by the main Axis whereon the Wheel hangs, drives the Roller *c*, which runs in Brass Collars, lodg'd in little Blocks of Wood, moveable to and fro, in hollow Mortices or Channels made on Purpose in the Pieces *h* and *i*. The Design of placing this Roller on these moveable Blocks, is to give it Liberty to recede more or less, as there is Occasion, from the Roller *b*. The Quantity of this Recess is adjusted by the Wedges *d d*, which pass through Mortices made for them, and whose Sides are contiguous to the Ends of these Blocks. Whilst the Apples are whole we give the Rollers the more Liberty, by raising these Wedges, but when we grind 'em over again the second time, after the first pressing, we confine the Rollers more, by forcing the Wedges down. The Rollers are to be placed, as that, when they have the most Liberty, they may but just run free between the Pieces *b* and *i*, and the Sides of the Frame of the Box, and two cross Bits of Wood lodg'd and fasten'd in the Inside of the same Frame, about the Place *B* and

and *C*, to the Intent that no big Pieces of Apple may drop thro' unground. *T* represents a hollow Conveyance, or Mouth, plac'd under the Rollers, to deliver the ground Apples into the Receiver or Tub *x*; the Handle *f*, at which a second Person turns, is plac'd so as to be elevated when the other is depress'd, that the Force may be the better at all times equally exerted. The Pieces *b* and *i* being pretty long, it is proper, in order to steady them, and prevent their swerving, to connect them together by cross Stays, or Bits of Wood, about the Places *E* and *F*. The Handles *e* and *f* are hollow wooden Tubes riding on Iron Spikes. The Height of the Frame of the Mill, from *G* to the Ground, is, about three Feet.

My Method of making Cyder.

After grinding I squeeze my Apples very hard with a strong Screw-Press, wrought with a Capstern in Hair Cloths, reev'd or drawn into the Form of a circular Bag, by means of Strings or Loops, four or five Bushels at a time, in as many Bags, with a round Board two Inches thick put between each Bag: These Boards are made of Inch Plank nail'd together cross-grain'd. When the Apples are one time squeez'd, I order the Cakes or Cheeses to be rubb'd to pieces, and ground and press'd over again; and if this were to be repeated even a third time, it would answer the Pains, for it would procure Liquor enough to pay the Wages of two Men for a Day; that

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that is, to defray the Charges of the Labour of your Cyder making. Twelve Buttels of Apples heap'd (which is the usual Way of measuring Apples) will by this Method most commonly yield more Juice than will fill a Beer Hogshead: About two Thirds of the Liquor runs out at the first pressing, the remaining Third at the following ones.

End of the First Part.



A General

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A General
T R E A T I S E
O F
Husbandry and Gardening.

P A R T II.

I N T R O D U C T I O N.

*Instructions to a Gardener, wherein is
demonstrated the Circulation of Sap,
the Generation of Plants, the Nature
of Soil, Air, and Situation.*



S it is the Opinion of some
People, that the bare publish-
ing of Experiments in Husban-
dry and Gardening, can be but
of little Use to the Publick,
unless they are cultivated and
promoted by ingenious and skilful Men ; I
shall

shall therefore take this Opportunity of laying before the World some Rules for the Education of those who design to profess or follow Agriculture or the Hortulan Art, that those Studies which are of the most ancient Date may not only be cultivated with new Vigour, but that the Practitioners, as well as the Theorists, may go Hand in Hand in the Improvement of our Lands.

Gardening and Husbandry are Sciences well becoming the greatest Philosophers, they have the Pleasure of taming or civilizing the little Wildnesses of Nature, and by that Means of ordering her Works in such a Manner as to make them become profitable and useful to our Interests; we are charm'd with her numberless Beauties, we recreate our Senses in the most innocent Manner, we preserve Health of Body, and I may add, we are free from noisy and impertinent Clamours, which daily present themselves in the hurried Part of the World; and if these Studies have the same Effect upon the Minds of others, that they have upon me, they do not a little contribute to set forth the Wisdom and Power of the *Great Creator*.

That I may therefore improve, as much as possible, a Science which may be so useful and beneficial to Mankind, I am the more earnest to cultivate that kind of Learning in a Philosophical Way; that in time it may be further improv'd, and the Curious may find more judicious Operations among the Practisers, and a Conversation becoming the Quality of that unbounded Study.

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1. In order to this I shall first propose, that only such as have a natural Bent of Genius to this Study should ever be brought up to so difficult a Profession.

2. That where such a Person is found, he should be instructed in the *Latin* Tongue, Writing, Arithmetick, Mathematicks, and Designing.

3. That he should, in the unbusy'd Times of his Practice, acquaint himself with the Rules and Terms of Botany, so far as they may relate to classing or assorting Plants to their respective Tribes or Families, and number them according to their Genders, as for Example, which I take from the Great Mr. Ray.

Gender 1. The imperfect Plants, which do either totally want both Flower and Seed, or else seem to do so, there having yet no Seed or Flower been discover'd to belong to them; such as Corals, Sponges, Algæ Conservæ, Duck-meat, or Lens Palustris, the Fungi, or Mushrooms, Tubera Terræ, or Truffle, the Mosses, and some Liverworts.

2. Plants producing either no Flower at all, or one seemingly imperfect, and whose Seed is so small, as not to be discernable by the naked Eye: Some of these bring their Seeds on the back Parts of their Leaves, as the Maiden-hairs, Spleenworts, Polypodium and Ferns; others bear it on the Stalk it self, adhering there by small single Foot-stalks, as the Lichen-Terrestris, the Lycopodium, or Wolfs-claw, the Golden Maiden-hair, the Moon-wort, Horse-tail, &c.

3. Those whose Seeds are not so small as singly to be invisible, but yet have an imperfect

fect or staminous Flower; *i. e.* such a one as is without the Flower Leaves, having only the Stamina, and the Perianthium; as Hops, Hemp, Mercurialis, Nettles, Docks, Sorrels, Arsefmart, Knot-grafs, Pond-weed, Oracle, Blite, Beet, Ladies-mantle, &c.

4. Such as have a compound Flower, and emit a Kind of white Juice or Milk when their Stalks are broken; such as Lettice, Sow-thistle, Hawkweed, Dandelion, Succory, Goats-beard, Nippleworts, &c.

5. Those which have a compound Flower of a discous Figure, the Seed Pappose, or winged with Down, but emit no Milk like the former; as Colts-foot, Flea-bane, Golden-rod, Ragweed, Groundfel, Cudweed, &c.

6. The capitated Herbs, or such whose Flower is compos'd of many small, long, hollow Flowers, gather'd together in a round Button, Ball, or Head, which is usually cover'd with a Scaly Coat; of which Kind are the Thistle, the greater Burdock, Blue-bottle, Knäpweed, Saw-worth, &c.

These have all Down adhering to their Seeds.

7. The Corymbiferous Plants, which have a compound discous Flower, but their Seeds have no Down adhering to them: The Name is taken from the Manner of bearing its Flower in Clusters, and spreading round in Form of an Umbrella, as Onions, &c. of this Kind is Corn-Marigold, common Ox-Eye, Yarrow, the Daisie, Camomile, Tansie, Mugwort, Scabious, Teasel, Eryngos, &c.

8. Plants with a perfect Flower, and having only one single Seed belonging to each
single

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single Flower ; such as Valerian, Corn-Sallet, Agrimony, Burnet, Meadow-Rue, Fumitory, &c.

9. The *Umbelliferous* Plants, which have a *Pentapetalous* Flower (*i. e.* having just five small Petals or Flower Leaves) belonging to each single Flower ; there are two Seeds lying naked and join'd together. They are call'd *Umbelliferous*, because the Plant, with its Branches and Flowers, hath an Head like a Lady's Umbrella, which they call Umbella.

This is a very large Genus of Plants, which therefore is subdivided into,

1. Such as have a broad flat Seed, almost of the Figure of a Leaf, or which are encompassed round about with something like Leaves ; as Cow-Parſnep, Wild and Garden-Parſnep, Hogs-Fennel, &c.
2. Such as have oblong Seed, swelling in the Middle, and larger than the former ; as Shepherds-needle, Cow-weed, Wild Chervil, common Speignel or Meu, &c.
3. Such as have a shorter Seed ; as Angelica and Alexanders.
4. Such as have a Tuberous Root ; as the Earth-Nut, Kipper-Nut or Pig-Nut, Water Dropwort, &c.
5. Such as have a small wrinkled, or striated Seed ; as Stone Parſley, Water-Parſnep, Burnch, Saxifrage, Caraways, Smallage, Hemlock, Meadow-Saxifrage, Samphire, Fennel, Rock Parſley, &c.
6. Such as have a rough, hairy, or bristly Seed ; as Mountain, Stone Parſley, Wild Carrot, Hedge and Baſtard Parſley, Chervil, Sea Parſnep.

T

7. Such

7. Such as have their Leaves entire, and not divided into Jags, &c. as Thorow-wax, Sanicle, the least Hares-Ear, &c.

10. The *Stellate Plants*, so call'd because their Leaves grow on their Stalks, at certain Distances, in form of a Star. Their Flowers are *Monopetalous*, but divided in four Segments, which look like so many distinct Flower Leaves; and each Flower brings two Seeds, which grow at the bottom of it. Of this Kind is, *Crofwort* or *Mugweed*, *Madder*, *Ladies Bedstraw*, *Woodruff*, *Cleavers*, &c.

11. The *Plantæ Asperifoliæ*, or Rough-leav'd Plants, have their Leaves plac'd alternately, or without certain order on their Stalks; they have a *Monopetalous Flower* cut or divided into five; after every Flower there succeeds commonly four Seeds, such as *Hounds-tongue*, *Wild Buglosse*, *Vipers Buglosse*, *Comfrey*, *Moufe-Ear*, *Scorpion-Grass*, &c.

12. The *Verticillate Plants*, says Mr. Ray in his *Synopsis Methodica Stirp. Britann.* have the following certain Marks or characteristick Notes, viz. that their Leaves grow by Pairs on their Stalks, one Leaf right against another; their Flower is *Monopetalous*, and usually in the Form of an Helmet or Hood; each Flower brings four Seeds usually, which have no other Seed Vessel but the *Perianthium*; for that Mark of their Flowers growing in Whirls about the Stalks, as they do in the *Dead Nettle*, *Hore-Hound*, &c. is not found in all Plants of this Genus; to these belong *Mother of Thyme*, *Mintb*, *Penny-royal*, *Vervain*, *Wood-Betony*, *Self-beal*, *Ale-boof*, *Bugle*, *Scordium*, *Mother-wort*, &c.

13. Such

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13. Such as have many naked Seeds (at least more than four) following their Flower, which therefore they call *Polyspermæ Plantæ Semine Nudo*. By the Words *Semine Nudo*, or naked Seeds, they mean such as are not included in any Seed-Pod or Case, out of which they readily drop, but such as either have no Covering for their Seeds, or else drop off with their Covering upon them. Of this Kind are *Pilewort*, *Crowfoot*, *Marsh-mallows*, *Avens*, *Strawberries*, *Cinquefoil*, *Tormentil*, *Meadow-sweet*, &c.

14. *Bacciferous Plants*, are such as bear *Berries*; as *Bryony*, *Dwarf-Honeysuckle*, *Butchers-Broom*, *Salomons Seal*, *Lilly of the Valley*, *Nightshade*, *Asparagus*, *Whorts* or *Whortle-Berries*, &c.

15. *Multisiliquous*, or *Corniculate Plants*, are such as have, after each Flower, many distinct, long, slender, and many times crooked Cases, or *Siliquæ*, in which their Seed is contain'd; and which, when they ripen, open of themselves, and let the Seeds drop out: Of this Kind is the common *Housleek*, *Orpine*, *Navelwort*, or *Wal-penny-wort*, *Bears-foot*, *Marsh-Marigold*, *Columbines*, &c.

16. Such as have a *Monopetalous Flower*, either *uniform* or *disform*, and after each Flower a peculiar Vessel or Seed Case (besides the common *Calyx*) containing the Seed, and this often divided or parted into many distinct Cells. These are sometimes call'd *Vasculiferous Plants*; such as common *Henbane*, *Marsh-Gentian*, *Bindweed*, *Throatwort*, *Rampions*, *Toad-Flax*, *Fox-Glove*, *Red-Rattle*, or *Cocks-comb*, *Eye-bright*, &c.

17. Such as have an *uniform Tetrapetalous Flower*, but bring their Seeds in oblong *Sili-*

quous Cases ; as Stock-gilliflowers, Wall-flowers, common Whitloe-Grass, Jack by the Hedge, or Sauce alone, Mustard, Charlock, or Wild Mustard, Radish, Wild Rocket, Ladies Smock, Scurvy-Grass, Woad, &c.

18. *Vasculiferous Plants*, with a seeming *Tetrapetalous Flower*, but of an *Anomalous*, or uncertain Kind ; for this Flower, though it be divided in four Segments, is nevertheless *Monopetalous*, and falls off all in one ; such as *Speedwell* or *Fluellin*, *Wild Poppy*, *Yellow Poppy*, *Loose-Strife*, *Spurge*, and *Plantain*.

19. *Leguminous Plants*, are such as bear Pulse, with a *Papilionaceous Flower*. Their Flower is *difform*, and almost in the form of a *Butterfly* and *Wings expanded*, (whence it has the Name *Papilionaceous*) consisting of four Parts join'd together at the Edges ; such as *Pease*, *Vetches*, *Tares*, *Lentils*, *Beans*, *Liquorice*, *Birds-foot*, *Trefoil*, *Rest-barrow*, &c.

20. *Vasculiferous Plants*, with a *Pentapetalous Flower*, like the sixteenth or eighteenth Kind, have, besides the common *Calyx* or *Cup of the Flower*, a peculiar Case containing the Seed, each Flower consisting of five Leaves or Petals ; such as *Maiden-Pinks*, *Campions*, *St. John's Wort*, *Male-Pimpernel*, *Chick-weed*, *Crane-bill*, *Flax*, *Primrose*, *Periwinkle*, *Centory*, *Wood Sorrel*, *Marsh Trefoil*, &c.

21. Plants with a true *Bulbous Root*, which Root consists of but one round Ball or Head, out of whose lower Part or Basis there shoot out many Fibres or Strings to keep it firm in the Earth. The Plants of this Kind, when they first appear, come up with but one Leaf, and the Leaves are nearly approaching to those of the

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the Grass Kind ; for they have no Foot Stalks, and are long and slender. The Seed Vessels are divided into three Partitions ; and their Flower is usually *Hexapetalous*, or seemingly divided into six Leaves or Segments ; such as *Garlick*, *Daffodil*, *Hyacinth*, *Saffron*, &c.

22. Such as have their Roots almost like *Bulbs* : These emit at first coming up but one Leaf, and in Leaves and Flowers have some resemblance of the true Bulbous Plants ; such as *Flower-de-Lis*, *Cuckoo-pint*, *Orcbis*, *Broom*, *Rape*, *Bastard-Hellebore*, *Tway-blades*, *Winter-green*, &c.

23. *Culmiferous Plants*, with a grassy Leaf and an imperfect Flower, are such as have a smooth hollow-jointed Stalk like Straw, with one long sharp-pointed Leaf at each Joint, encompassing the Stalk, and set on without any Foot Stalk : Their Seed is contain'd within a chaffy Husk ; such as *Wheat*, *Barley*, *Rye*, *Oats*, and most kind of Grasses ; the Straw of the *Wheat* and *Barley* has four Knots each from the Root to the Ear.

24. Plants with a grassy Leaf, but not *culmiferous*, with an imperfect or staminous Flower ; as *Cypress Grasses* and *Rushes*, *Cats-tail*, *Bur-Reed*, &c.

25. Plants whose Place of Growth is uncertain and various ; but chiefly Water-Plants, as the *Water Lilly*, *Water Mill-foil*, *Water-wort*, *Pepper-grass*, *Mouse-tail*, *Milk-wort*, *Dodder*, &c.

There is also another common Division of Plants, into Trees, Shrubs, Under Shrubs and Herbs, which I shall mention in some other Papers, for the sake of those who have not

had Education enough to read the Original Works of the *Botanical* Authors with Ease and Pleasure. In the mean time, for the more easy understanding of this Account of the several Genus's of Plants, I shall explain a few Words mention'd in it : As first, what is meant by the *Petala* of Flowers. The late curious and indefatigable Mr. *Petiver* thought it proper to make an *English* Term of the *Petala* of Flowers, by calling the Leaves of a Flower the *Petals* of a Flower ; for, as he observ'd, if a Person was to ask for Rose Leaves, they may be as well the green Leaves of the Tree, as the Leaves of the Flower ; for which Reason, where *Petals* are us'd, either by him or myself, they are to be understood the same as *Petala*, or the Leaves of a Flower, as the *Greek* expresses : But because most Flowers abound in *Petals*, or have more than one, so there are proper Terms to signify the Number of those *Petals*, which are usually mention'd by *Botanical* Authors, where their Numbers are express'd in *Greek*. First,

Monopetalous is a Term us'd for a Flower that has but one Leaf, or has but one *Petal*, as the *Campanula* or *Bell-Flower* ; so call'd because the *Petal* or Leaf of its Flower is of one Piece like the Figure of a Bell.

Dipetalous signifies a Flower which has but two Leaves or *Petals*.

Tripetalous is a Term for a Flower with three Leaves only.

Tetrapetalous expresses a Flower with four single Leaves or *Petals* only.

Pentapetalous, a Flower with five single Leaves or *Petals*.

Hexa-

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Henapetalous, a Flower of six distinct Leaves or *Petals* ; for the *Bell-Flower* is notch'd on the Edges of the Blossom, and many others have their Blossoms cut or notch'd within a small way of the Bottom ; yet as these Notches do not part the Blossom into so many distinct Leaves, it remains still a *Monopetalous Flower*, or may be said to have but one *Petal*.

Polypetalous signifies a Flower that has many Leaves without any certain Number. As,

Polysperma signifies any Plant which bears many Seeds, without expressing a certain Number ; so

Polyanthos is a proper Term for a Plant that brings many *Flowers*, which is the true Meaning of the Word.

He should in the next place be acquainted with the Anatomy of Plants, and have some Ideas of the Motion of their Juices, which the following Part of this Introduction will hint to him.

For the Use of these Persons I shall begin with explaining to them the Meaning of the Word *Circulation*, and open the Case to them in as plain Terms as possible ; for without we have a right Knowledge of this Particular, all our Attempts towards the Improvement or Preservation of Vegetables, will be as uncertain as if a Man was to undertake the Practice of Physick without any Understanding or Knowledge of Animal Anatomy.

First then, Let us consider the Word *Circulation* with regard to its Signification. It is taken from the *Latin Verb Circulo*, which signifies *to go about*, or *search about*. When we speak of the Circulation of Blood in Animal Bodies, we mean the going about of the Blood

through all the Parts of those Bodies from its Fountain, and returning thither again; and in these Bodies, when ever that Motion of the Blood stops, Death ensues; so that to preserve Life in the Bodies of Animals, it is necessary the Blood be in continual Motion through the Vessels, and their several Branchings, or Ramifications, leaving as it passes by the several Parts of the Body, such Juices as are necessary for the Nourishment and Support of each Particular, and at its Passage by the Fountain, renewing its former Vigour, and taking in a fresh Supply of wholesome Nourishment, to make good what it has lost in its Course, and to supply the same Parts it did before as it passes by them.

This Motion of the Blood through the Arteries and Veins about the Body, is not in streight Lines downward and upward, but by many thousand Turnings and Windings which correspond with every Part of the Body, so that no one Part is neglected by the Blood in its Motion about it. We may observe in the Foot of a Frog, the Tail of a Neut, or of a Fish, how finely the Blood Vessels are dispos'd, so as to feed every Part with due Nourishment; and in the Leaves of Trees, especially in the Leaf of the Fig, we may easily discover the curious Distribution of the Sap-Vessels for the Nourishment of every Part of the Leaf; and that the fine Net-work which we observe in that Leaf, is compos'd of Vessels thro' which the Sap circulates or passes, is very evident, if we cut any one, or all of them, the Milky Juice immediately shewing it self, and flowing from the Vessels that have been cut.

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The Plant which shews us the flowing of the Sap in the Leaves, and other Parts, somewhat plainer than the Fig, though the Vessels lie more conceal'd in the Leaf, is the *Great Garden Spurge*, which I have cut and wounded in several Parts, at great Distances from one another, and thereby prevented the Communication of the Sap with some of the intermediate Parts; so that if I made Incisions in those intermediate Parts, a Minute or two after I had cut cros one or two principal Vessels which led to them, there would no Milk flow from them. It is also possible, by Ligatures, to stop the Course of the Sap, and prevent its Passage into any Part we are minded; which to me is Demonstration, that the Juices in Plants have a Motion throughout the whole Plant, or circulate about it as the Blood does in the Bodies of Animals, and not up and down only in streight Lines, as has been suppos'd by several Gardeners. Indeed there are in the woody Parts of Trees, streight upright Vessels, thro' which, I suppose, the Sap has a Passage; but these Vessels continue no longer streight than till they reach to a Bud, and then they branch forth and enter that Bud to serve it with Nourishment, to feed it till it is explain'd and open'd, and then branch again into the several Buds in that Branch, and so on till the Tree is fully perfected.

At the same Time we must take Notice, that the Vessels which I here mention to pass through the Wood, spread themselves, and are branch'd forth into the Roots, and are inoculated into others; so that throughout the

the whole Plant there are Sap Vessels which maintain a Correspondence between one Part and another, from the extream Parts in the Head, to the extream Parts of the Root: So that there is the same Reason to judge, that when any Part of the Tree is invenom'd, or poison'd in its Juices, the rest will be infected by it; as there is Proof that some of the poisonous Matter taken from the Pustules of the Small-pox, and inoculated in an healthful Person, will soon after shew it self in several Parts of the Person so inoculated.

I have lately observ'd in a Gentleman's Garden near *Bristol*, some Plants of the *Brazile Jessamine* which were grafted upon the *Common Jessamine*, whose Leaves were very strongly blotch'd with Yellow; the *Brazile Jessamine* by this Means is so extreamly ting'd with Yellow, that there is hardly any Green to be found in its Leaves; by which it is evident, that the poisonous Juices which occasion'd the Blotches in the *Common Jessamine*, have by Circulation mixt themselves with the healthful Juices in the *Brazile Jessamine*, and have spread the Distemper over the whole, which could not be done by any other Means.

Another Instance of the whole Body of a Plant becoming envenom'd, by approaching a striped Plant to it, I have observ'd in Mr. *Fairchild's* Garden at *Hoxton*. He inarched a Branch of the *Brazile Jessamine* into a Stock of the *Common Jessamine*, whose Leaves were edg'd with White; the inarched Branch grew, and though it was not long before it was cut from the Mother-Plant, i. e. the *Brazile Jessamine*, yet the Juices in the whole *Brazile Jessamine*.

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mine became tinged and spotted, but not with so strong a Colour as I observ'd in those which are grafted upon the *Yellow-blotch'd Jessamine* mention'd above ; which shews, that the Yellow Colour in Plants is far more insinuating than the White. Mr. *Fairchild* has many other Experiments, which prove the same Thing, but I have not his Leave yet to mention them.

I have often thought, that when we had a mind to make a Plant become striped, we might immerge some thin Pieces of Sponge in Juice of striped Plants, and bind them into the young Shoots of Plants between the Wood and the Bark. This Way, I am apt to think, would cause Variegations in the Plants they are inoculated into, as surely as that the *Pus* taken from a Blotch of the Small-pox, will disperse its Venom thro' the whole Body of a Man soon after Inoculation ; in neither of which Cases the Poison need be actually in a lively State when we apply it, but may be us'd some Time after it has been taken from its Original Seat.

In some of my Perambulations I observ'd great Variety of Distempers in Plants, which occasion'd the striping of their Leaves, and I think an Account of them will not help a little to prove the Circulation of Sap through every Part of a Plant ; observing in the first Place, that for the better Support of those Vessels which I have been speaking of, for the Conduction of Sap, there is a Sponge-like Body through which they all pass, and are thereby kept in their proper Station, and are also defended from the Sun, which would dry them

them up, were it immediately to come at them. This Spongy Body is compos'd of small Vessels which are interwoven with one another, and have also a close Communication with the Vessels I have already mention'd, and imbibe a certain Moisture from the Air, which is necessary for the good Health of the Plant. For we find, that if we shut up a Plant in a close Place, where it is debarr'd from Air, it turns pale and sickly, and its Leaves and Shoots become faint and languid, even so as to bring Death upon the Plant: But this Sponge-like Body, which terminates in the Bark of the Plant, when it has the Benefit of the Air, keeps the Plant alive, and helps it to resist the Distemper, which it sometimes receives from the Nourishment it takes in at the Root, or by other Accident. And I find by Experience, that when this Spongy Part is infected, which one may know by Stripes of White or Yellow appearing in the Bark, there is no Remedy, or, in other Terms, there is no Possibility of ever getting the Stain out of the Plant; though we were to inarch twenty healthful Plants into it, and their Juices were to circulate through it for a Twelve-month, yet all our Return would be to find that it would infect and tinge the healthful Plants with its Distemper.

But let us now see how differently Plants are affected by Distempers which flow in their Juices.

First, We have Plants which appear blotched with Yellow in their Leaves, only in the Spring and in the Autumn Seasons, but those Marks disappear by the Strength they gain in the

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the Summer; *Rue*, *Thyme*, *Pot-Marjoram*, and *Stone-crop*, are often of this Sort. This Distemper is somewhat like the Scurvy, Itch, and such-like Cutaneous Distempers, which generally appear about the same Seasons.

Secondly, We have Plants that are continually blotch'd with Yellow in the Spongy Part of their Leaves, whilst the Sap Vessels are of a pleasant healthful Green; of such Sort is the *Blotch'd Alaternus*, the *Orange-Mint*, and some others. To give these Strength, by means of rich Manure, or inarch them into healthful Plants, the Distemper will be overcome, and the Yellow Colour be chang'd into a lively Green: This is somewhat like the Jaundice in Animals.

Thirdly, We have Plants whose Juices are so inveterately poison'd, that their Distemper is continu'd from Generation to Generation; the Leaves of some are maculated or spotted, others edged, others blotched, and others striped, such as the *Sycamore*, *Bank-Cress*, *Self-Heal*, *Borage*, *Archangel*, *Water-Betony*, and *Striped-Sallary*; all which bring striped Plants from Seed, I think their Case is not much unlike what we observe in such Animal Bodies as are afflicted with such Hereditary Distempers as the Evil, the Leprosy, or the Pox sometimes happens to prove. We must observe however, that all the Seedling Plants I speak of are not affected alike; some are more striped, some less, and now and then some few will come healthful, and be entirely Green in their Leaves. Surely such Plants, whose very Seeds do not escape being infected, could never be, if there was not as due a Circulation
and

and Secretion of Juices in them, as there is in Animal Bodies. I suppose 'tis hardly possible to eradicate such Distempers in Plants, without a considerable Length of Time, and a vast deal of fresh Nourishment thrown into them.

This Knowledge leads us partly to the Cure of Distempers in Plants, and also will instruct us a great deal in the Pruning them, and the Seasons for it; nor does it inform us less of the Cautions to be taken in the Removal of Plants, or of strengthening our Flower-Roots for future Blowing; for it has been experienc'd, that in Plants of the lower Race, when they are cut down near the Root, at a Time when the Sap is in its highest Vigour, such Plants have always been weak the following Year and have sometimes perish'd. The curious Mr. *Fairchild* observ'd, that one Summer he had a Bed of *Striped Lillies* which were rising to Flower, were in the Height of their Sap cut off by Lightning, and the next Year scarce one in an hundred was strong enough to blossom; and the second Year not above four in the whole Bed were strong enough to blossom: So if we make any great Amputation upon any Tree of our own Growth, when the Sap is in its full Vigour, it will weaken and endanger the Tree.

As an Illustration of what has been here related concerning the Circulation of Sap, I shall add a Letter which some Time since I sent to Dr. *Douglafs*.

To



*To Dr. Douglass, F. R. S. in Bow-Lane,
London.*

S I R,

“THE *Turkish* Method, which has been
“ lately brought into *England*, of ino-
“ culating the Small-pox, has furnish’d me
“ with many Hints which tend to the further
“ Discovery of the Circulation of Sap in
“ Plants.

“ I have in many of my Writings given In-
“ stances of the Analogy between Animals
“ and Vegetables, and have as often brought
“ Experiments to confirm the Sap’s Circula-
“ tion, and the Generation of Plants ; both
“ which Discoveries, the more we know of
“ them, the more it is in our Power to im-
“ prove our Fields and Gardens.

“ Mr. *Fairchild* of *Hoxton*, who has been
“ very diligent and curious in these Enquiries,
“ gave me lately two or three excellent Ob-
“ servations of his own, concerning the Sap
“ of Plants : He tells me, that having graf-
“ fed the ever-green Oak, or *Ilex* of *Virginia*
“ upon the common Oak, the Leaves of the
“ common Oak, which was the Stock, de-
“ cay’d and fell off at the usual Season of the
“ Year ; but the ever-green Oak, which was
“ the

“ the Cion grafted upon it, preserv'd its Leaves,
 “ and continu'd shooting in the Winter ; so
 “ that when Trees drop their Leaves, the Sap
 “ remains yet in Motion, and is not gone in-
 “ to the Root, as some People think.

“ A Case of the like Nature I had once
 “ of the Common Laurel, or *Lauro-Cerasus*,
 “ which I inoculated upon the wild black
 “ Cherry ; the Leaves of the black Cherry
 “ dropt about *September*, but the Buds of the
 “ Laurel shot or sprouted some time after, and
 “ remain'd Green all the Winter.

“ To this we may add what we observe
 “ of the Mistleto or *Viscum*, which is not only
 “ an Ever-green, but even grows and ripens
 “ its Fruit a long Time after the Tree it
 “ grows upon sheds its Leaves. Mr. *Fair-*
 “ *child's* Experiment indeed of the *Ilex* is suf-
 “ ficient to shew that Sap has a Mode of Cir-
 “ culation ; and my own Remarks serve to
 “ confirm it.

“ But let us proceed to explain this a little
 “ further, and from hence answer the Obje-
 “ ction which has been generally made against
 “ the Circulation of Sap, *viz.* that at the
 “ Fall of the Leaf the Sap always returns to
 “ the Root.

“ Whoever knows any thing of the Circu-
 “ culation of Blood in Animals, cannot be ig-
 “ norant that there are Arteries and Veins
 “ through which it passes ; the first to convey
 “ it from its Fountain, the second to return
 “ it back ; and that when this circulative Mo-
 “ tion is stopt, Death ensues.

“ Every

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“ Every Plant has Vessels analogous to these,
“ which perform the same Offices : Those
“ Plants which loose their Leaves, and do not
“ grow in the Winter, are like those Animals
“ which sleep in the Winter ; but those Plants
“ which are ever-green and grow in the Wint-
“ ter, are like those Animals which have a con-
“ tinued Life ; and yet both of these have a
“ Circulation of Juices perform’d thro’ Pipes
“ of the same Kinds we have mention’d.

“ Among the Animals which sleep in the
“ Winter-Season, we find that the Urchin or
“ Hedge-hog, the Batt and the rest, are laid
“ to sleep at the Approach of Cold, which
“ thickens their Juices ; and if we bring these
“ Creatures, in their sleeping State, into a
“ warm Room, or near a Fire, they recover
“ their Motion, and become brisker by de-
“ grees ; but those which have continu’d Mo-
“ tion, or always an Opportunity of it, are
“ generally more dull and sleepy in the hotter
“ Seasons : So that this Difference seems to
“ depend upon the Temper of the Juices. And
“ there are many Experiments which prove
“ that the Difference of Juices in all Bodies
“ is caus’d by the different Frame and Tex-
“ ture of those Vessels or Strainers they are fil-
“ ter’d through, as I have hinted in another
“ Part of this Work.

“ The ever-green Oak has all the Characte-
“ ristics belonging to the common Oak, but
“ the dropping the Leaves ; and ’tis only the
“ different Model of the Vessels in one and
“ the other that causes the Variety of Ever-
“ green, and the contrary ; the Vessels in the
“ Ever-green dispose the Juices to act with a

" less Degree of Heat, as those in the com-
 " mon Oak dispose the Juices to require a
 " greater Share of Warmth for their Growth.
 " The shooting of the ever-green Oak, the
 " Laurel, and the Mistleto in the Winter, when
 " the Perdifols are vacant of Leaves, shew
 " us they have Vessels which frame different
 " sorts of Juices, and the Difference of those
 " Vessels may be easily discern'd with a good
 " Microscope.

" The next Observation of Mr. Fairchild
 " is, that to cut a Shoot of a Fig-Tree or a
 " Mulberry-Tree, not only in the Summer
 " but in the Winter, the Sap runs out always
 " at both Ends, which shews that there are
 " as well proper Vessels for the Return of the
 " Sap, as for it to rise thro' from the Root ;
 " one End of the before-mention'd Branches
 " exhibiting the returning Sap, the other flow-
 " ing with that which proceeds immediately
 " from the Fountain thro' the Wood Vessels.
 " This Experiment he shew'd to the *Royal*
 " *Society* in the Winter, which helps further to
 " confirm the Circulation of the Sap. But any
 " thing so new as this Doctrine, which I first
 " ventur'd to explain six Years ago, cannot
 " be too well supported by Observations and
 " Experiments. I therefore shall add an In-
 " stance or two more, before I begin to see
 " forth the Effects of Inoculation.

" That the Sap even of those Trees which
 " lose their Leaves, does not return to the
 " Root to lodge there in Winter, is evident in
 " the Trunks of Elms and other Trees which
 " are cut from the Roots in Winter, and e-
 " ven after they are bored for Water-Pipes ;
 " many

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“ many Months after their Fall, we find that
“ they make Shoots, and spring from every
“ Joint, as if they had a Communication with
“ the Root, which they could not do if the
“ Sap had gone down to the Root at the Fall
“ of the Leaf. In this Case one may observe
“ that the Pith is not of very great Use for
“ preserving the Life or Vegetation of a Tree :
“ I rather think it is the Part wherein the
“ Flowers, Fruits, and their Parts are form’d ;
“ for we never find it in its Purity but in the
“ younger Shoots, of a Year old, or two at
“ most, from whence it is convey’d to those
“ Sprouts of the Tree which shoot from them :
“ We find likewise, that in some Plants there
“ is scarce any Pith discernible, as in the Jess-
“amine, the Honey-suckle, and the Vine ;
“ and also in the Gramineous or Grassy Tribes ;
“ but it may be that Defect is made good by
“ Nature in the Knots of those Plants, which
“ I believe have a certain Number appointed
“ for each Shoot : I know that Wheat and Bar-
“ley have four Knots in each Stalk, reckon-
“ing from the Root to the Ear.

“ Again, the Vines, whose Cuttings the
“ Gardeners set in the Winter, when they
“ commonly say the Sap is down, have so
“ dry a Look at that Time, that one who is
“ unacquainted with the Laws of Nature,
“ would imagine them to contain no Moi-
“sture ; but it is plain they are not without
“ it, because they strike Root, and the Root
“ always proceeds from the Natural Moisture
“ in the Cutting or Layer, and is enliven’d
“ or set to work by changing its Element ;
“ as if we bring a Branch from the Air into

“ the Earth, or from the Air into the Water;
 “ it will alter its first Design, and fling out
 “ Roots where otherwise it would have put
 “ out Branches.

“ In the next Place we may observe, that
 “ every Stick which we cut from a Tree in
 “ Winter, long after its yearly Growth is fi-
 “ nish’d, will push out its Sap with a hissing
 “ Noise at both Ends, if we lay it upon the
 “ Fire; so that it appears the Sap was not
 “ gone down to the Root, but was really in
 “ the Stick and every other Part of the Tree;
 “ only was not fluid enough in the open Cold
 “ to push on the Growth of the Tree.

“ I remember once I saw some large Elm
 “ Stakes drove into the Ground to support a
 “ Hovel, and one of them which was placed
 “ by the Back of a Kitchin-Chimney, where
 “ a Fire had been constantly kept, had shot
 “ forth into Leaves about *Christmas*. These
 “ Stakes, I was told, had been cut six Weeks
 “ before I saw them, from a large Trunk which
 “ had been lying in the Farm-Yard above a
 “ Year. From this we may be assur’d that
 “ the Sap is always in the Tree as well as
 “ the Root, and that when the Tree can have
 “ a right share of Heat to keep the Sap in a
 “ certain Degree of Fluidity, it will grow;
 “ and we find the same in those Trees which
 “ are encourag’d to grow and blossom in the
 “ Winter by artificial Heats.

“ The Experiments of the variegated com-
 “ mon Jessamine, whose Leaves are edg’d with
 “ White, further declare the Circulation of
 “ Sap. We find by inarching or inoculating
 “ that striped sort into either the plain com-
 “ mon

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“ mon sort, or the *Spanish* Jessamine, or the
“ *Indian* or *Brazil* Kinds, that the Malignity,
“ which causes the Whiteness in the Leaves of
“ the first, mixes it self in such a manner with
“ the Juices of the Plants 'tis ingrafted with,
“ that their Leaves become infected and ting-
“ ed in some Places with the White Colour,
“ which, in my Opinion, is a plain Demon-
“ stration of the Sap's Circulation, as I have
“ mention'd in my former Works: Nay, if
“ we put only a Bud of the variegated Sort
“ into a plain Jessamine, ten or twelve Foot
“ above Ground, the Poison will reach the
“ Branches next the Root as well as those
“ which are at as great a Distance above it,
“ and has also the same Effect upon the ever-
“ green Sorts.

“ The curious Mr. *Greening*, Nursery-man
“ at *Brentford*, told me he had seen some Ash
“ Trees that had been budded or inoculated
“ with some Buds of a striped Ash, which (tho'
“ the Buds had not sprouted) yet the Shoots
“ of the budded Trees, which were below the
“ Inoculations, became variegated or striped.
“ But it is necessary to remark, that there
“ are three sorts of Variegations or Stripes in
“ Plants; that which seems to have the least
“ Share of Distemper in it, shews it self in
“ yellow Spots here and there in the Leaves
“ of Plants: But White is a sure Sign of
“ Weakness and Distemper; so that two Leaves
“ are never exactly mark'd in the same Man-
“ ner. This the Gardeners call the yellow
“ Bloach or Blotch.

“ The Second is the white Bloach, which
“ commonly marks the Leaves of Plants with

“ a great Number of Spots or Stripes : Those
 “ which lie next the Surface of the Leaf are
 “ the whitest ; and are, for the most part, ac-
 “ companied with other Marks of a greenish
 “ White, which lie deeper in the Body of the
 “ Leaf, even in the Ramifications of the Sap
 “ Vessels ; but in neither of these Cases is the
 “ woody Part of the Plant variegated. Mr.
 “ *Fairebild* observes, that where the Leaves of
 “ a Plant are striped in this manner, shewing
 “ three or four Degrees of Colour, there is
 “ Hopes of its becoming what the Gardeners
 “ call an Edge ; that is, to have its Leaves
 “ edg’d with White, which, in Gardening, is
 “ thought to be the most beautiful Degree of
 “ Striping, and has this certain in it, that it
 “ will not by any Means whatever be again
 “ brought to produce plain green Leaves ;
 “ the Wood, the Bark, and the Fruit, is in
 “ this Case always variegated, as well as the
 “ Leaves. So powerfully has the Distemper
 “ establish’d it self in the Tree, when its Leaves
 “ are once edg’d with White, that its most
 “ noble Parts are all ting’d with the Morbid
 “ Matter, and there is no Possibility of remo-
 “ ving it ; even the very Fruit, its generative
 “ Parts are infected, and its Seed produces
 “ Plants more or less partaking of the Distem-
 “ per of the Mother-Tree.

“ Where Trees are bleach’d or spotted on-
 “ ly with Yellow or White, there is a Possibili-
 “ ty of recovering the Plants to their genuine
 “ Verdure, by inarching into ’em an healthful
 “ Stock of the same Species, and letting those
 “ Stocks remain a Year or two joyn’d with
 “ them : The Juices of the strong Stocks will
 “ over-

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“ over-power the Distemper, and sling out
“ the vitiated Juices thro’ the Pores of the
“ Leaves, which is a kind of Transpiration,
“ The strong Stocks however may perhaps
“ shew some Marks of the Distemper, by par-
“ taking of the uncorrected Juices of the va-
“ riegate Plant ; but this is not constant, the
“ Natural Vigour of the Stock sometimes is so
“ powerful, that the Venom it receives from
“ the Plant join’d with it, is not presently to
“ be discover’d. I may also observe at this
“ Time, that I have join’d healthful vigorous
“ Stocks with the old decaying Trees, and
“ have brought those old Trees to recover
“ their first Vigour.

“ If we design to communicate the infected
“ Juices in great Abundance to any Plant
“ which we have a Mind should become stri-
“ ped, the Method now in Practice is, to
“ chuse such Stocks to bud or inarch upon, as
“ have their Leaves edg’d, which I have said
“ before are thoroughly distemper’d, and there-
“ fore are more capable of infecting the fresh
“ Plants inoculated or inarch’d upon them.
“ A single Bud or Eye plac’d in the Escutche-
“ on of the distemper’d Tree, where it can
“ only receive its Nourishment from the vitia-
“ ted Juices, will become variegated in Propor-
“ tion as it draws of that Nourishment more
“ or less, and partake of more of the yellow
“ or white Juice, than if a Branch was to be
“ inarch’d, because the Bud has nothing to
“ nourish it but the Juices of the Plant it is in-
“ oculated upon ; but by inarching, the Cion
“ is fed both by the striped Plant, and a Plant
“ of Vigour which causes less striping. We
“ have

“ have some Instances of this at Mr. *Fairchild's*
 “ at *Hoxton*, and other Places.

“ The Method of inoculating of Plants is
 “ not unlike the Manner of inoculating the
 “ Small-pox on Humane Bodies : We open the
 “ Bark of the Plant we design to inoculate,
 “ ’till we discover the flowing Juices from those
 “ Vessels which act as Veins, and then imme-
 “ diately apply the Bud with Part of the Bark
 “ which joins it to the Place we have open’d ;
 “ observing, that the Bark adjoining to the
 “ Bud has those Parts with it, that according
 “ to Nature’s Rules should next be placed to
 “ what I call the Veins of a Tree ; we then
 “ bind it on, and let it remain till it begins
 “ to grow. And in all the Experiments we
 “ make, according to the above Directions,
 “ we shall find the Plants or Cions will par-
 “ take of the striped Colour or Variegation ;
 “ which among the Virtuosi in Gardening is so
 “ much admired, that a Plant whose Leaves
 “ are well striped with White or Yellow, will
 “ sell for more than twenty times the Value
 “ of it when its Leaves are plain ; the striped
 “ Hollies, Oranges, Lemons, Myrtles, with
 “ above an hundred more Sorts of striped
 “ Plants, which Mr. *Fairchild* has collected,
 “ are so many Witnesses of it.

“ From these Observations I think it is as
 “ evident that the Sap circulates in Plants, as
 “ that the Blood circulates in Animals, and
 “ that there is the same Possibility of ingraft-
 “ ing Distempers, and vitiating the Juices of
 “ Vegetables, as of poisoning or infecting the
 “ Blood in Animal Bodies : And that leads me
 “ further to consider of some new Experiments
 “ which

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“ which I would have made by the Gardeners
“ in order to produce Variegations in Plants,
“ some of which would have a noble Appearance, and be very ornamental in our Gardens, especially such as have large Leaves.
“ One sort of Vine Mr. *Fairchild* has already
“ got, with its Leaves finely edg’d with White ;
“ so that I see no room to doubt, but by inoculating of that into some other sorts, or
“ budding some other sorts into that, we might
“ variegate them as we pleased. There is
“ likewise a Fig-Tree in the Possession of Mr.
“ *Greenhill* of *Putney*, which has its Leaves
“ edg’d, and might be made to variegate others by the same Means. But in this, and
“ all the foregoing Remarks, I have had Regard only to Tribes or Families, that is,
“ to observe that the Stock and the Cion
“ were both of the same Family : But in the
“ following I have a Mind to try if it is not
“ possible to stripe one Tribe of Plants by
“ the variegated Parts of another. Indeed I
“ have some Difficulty in this, when I consider that there is the same Difference between
“ Plants of different Tribes, as there
“ is between Animals of different Tribes, and
“ that in the Animal Kingdom we find that
“ what is of ill effect to one Family, is not
“ always the same to another ; neither in case
“ of Pestilence will that which affects one Animal infect another. But I remember some
“ Letters which have been sent to the Royal
“ Society, which relate several Experiments that
“ have been made, of transfusing the Blood
“ of Brutes into the Vessels of Men ; and has
“ succeeded so far as to make the Men partly

“ to partake of the natural Temper of those
 “ Brutes. The Operation, if I forgot not,
 “ was made upon some Malefactors, who had
 “ first a great Quantity of Blood taken from
 “ them, and then, by a certain Method, the
 “ Blood of a Dog in one, and that of a Sheep
 “ in the other, was made to supply their Loss
 “ of Blood. Several Instances of this kind we
 “ have in the *Philosophical Transactions* ; and
 “ as often we hear of the natural Tempers
 “ of the Creatures, in which the Blood was
 “ transfus’d, being chang’d by such Transfu-
 “ sion. If this is so, and that a Man or any
 “ Animal can live, and the Blood of a Dog or
 “ a Sheep become agreeable to his or their
 “ Blood, so as to circulate together, I doubt
 “ not but if either the Dog or the Sheep had
 “ any poisonous Particles in their Blood, it
 “ would have appear’d upon the Men, or any
 “ other Bodies it was transmitted into ; the
 “ Mange or the Murrain would have caus’d
 “ some scrophulous Distemper. ’Tis there-
 “ fore I am inclin’d to think (if I find a Plant
 “ compleatly variegated or edg’d with Stripe)
 “ that by transfusing some of the vitiated Sap
 “ into the Vessels of one of another Tribe, I
 “ may cultivate a Variegation in the Leaves
 “ of the Plant which I transfuse the Sap into :
 “ For Example ; if I find a Peach-Tree whose
 “ Leaves are well striped, I would take of the
 “ Juice of those Parts of the Leaves which
 “ appear’d White or Yellow, and opening the
 “ Bark of a Plumb-Tree, or even an Apple-
 “ Tree, pour in some of this vitiated Juice,
 “ and bind it up ; or else take off the Parts
 “ of Leaves that were variegated in one,
 “ and

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“and stripping them of their Skin, would
“bind them into the Incision in the same
“manner that we inoculate a Bud; or per-
“haps to inoculate a striped Bud of one Tribe
“into a Tree of another Tribe, might answer
“what I propose. I design to try whether it
“is not possible to make a Dog mangy, by
“inoculating into some Part of the Dog some
“of the Pustules, with their purulent Matter,
“taken from a Person who has the Itch, or
“some other Cutaneous Distemper.

I am, Sir,

Yours, &c.

R. Bradley.

To this I shall add the following Account concerning the Variegating of Tulips, from whence I think the most stubborn Opposers of this Doctrine may be convinc'd.



of



Of the Growth of Tulips, with some Hints concerning the Circulation of Sap, &c. tending to discover a Method of Breaking Breeding Tulips, or making the plain Flowers become striped.

S I R,

I Have lately had an Opportunity of viewing and considering several Collections of Breeding Tulips, and have gather'd a few Remarks concerning them, which hitherto has been but little observ'd, though I believe the Breaking or Striping of Tulips very much depends upon them.

First, We are to observe that a Tulip does not preserve its Root two Years together, but the Root that was taken out of the Ground last Year, is quite lost this Year, in the Leaves, Stem, Flower, and Seed ; and while these Parts are growing, and by that Means diminishing the Root they spring from, the Juices which circulate thro' them, are framing a fresh Root bordering upon the Place where the first was : So that when the Plant has perform'd all its Summer-Work, there remains no old Root at all, but the Flower-Stem sticks to the Side of the new-made Root. You may be sure this Root is new, because the Stalk stands on the
the

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the Outside of it, and every one knows that the Flower-Stalk always comes out of the Middle of the Root that was planted.

While Tulips are under several Degrees of Growth, from the very first putting forth of the Leaf the Root declines daily, and a new Root is forming it self and daily encreasing; and when the Flower and Seed is fully perfected, the old Root is entirely wasted, and the new one is fully compleated.

To discover this, I took up several Tulip-Roots in different Degrees of Growth, and in Proportion to the Times they severally requir'd to perfect their Seed: I observ'd the new Roots were greater or smaller, as there was less or more of the old Root left. Before the Flowers were colour'd, I found the old Roots were but half decay'd, and the Cloves in those Roots on the Outside began to dry.

When they were in full Bloom, the Cloves which were remaining were all inclining to dry, and there were three, and sometimes but two in Number in the old Root; and then the young Roots were very strong.

While the Tulips were in this State, I took up several Roots of the large Red Breeding Tulips with Black Bottoms; the Roots and Stalk of one of them, which I split thro' the Middle, I have delineated, for the better explaining of this Relation.

Fig. III. *A* is part of the old Root with its declining Cloves, from the Bottom of which springs the Flower-Stalk *B*. This Flower-Stalk is partly fix'd to a hard Substance, like the
Kernel

Kernel of an Hazle-Nut at *C*, and partly at the Bottom of the new-framing Root *D*, which is likewise of a Substance like the Kernel of a Nut ; and from thence the Cloves of the Root take their Rise. *E* shews the Point of the new Root, from whence the Fibres will spring the next Year, as *C* does the same Part where grow the Fibres of this Year : And here is plainly a Correspondence between all the Parts, both of the new and old Roots ; but 'tis the old Root which only receives the immediate Nourishment from the Earth by its Fibres.

When we split the Flower-Stem of a Tulip, we find a great Number of Vessels running thro' the Stem till they come at the Flower, and are then branch'd into the Petals or Flower-Leaves, and distribute Nourishment into the *Stamina*, the *Apices*, and *Pistillum* of the Flower ; but where the Flower-Leaves are set on, the Stalk becomes larger, and is of much harder Substance than in other of its Parts.

Again, when we examine a whole Tulip-Plant in Flower, and first cut the Stalk horizontally within an Inch of the Root, we find the Sap Vessels much closer set together than they are towards the Top of the Stem. These Vessels, as they rise from the Root, branch themselves into the Leaves which grow upon the several Parts of the Stalk.

I infer from these Observations : *First*, That all these Parts, *viz.* the Flower-Stem, the Leaves, the Flower, and the Seed, are all perfected from the very Root that we put into the Ground, and prove more or less luxuriant,

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luxuriant, only as the Soil is more or less favourable to the Tulip ; the Nourishment the Tulip receives from such Soil, is taken in by the Fibres.

Secondly, That by the Wasting of the old Root, and the Growth of the new one, which both correspond immediately with the Flower-Stem, it is plain that the Sap circulates thro' the Whole ; for the new Root has no Fibres to nourish it and make it grow from the Earth, and therefore can be nourish'd only from some Vessels in the Stem upon the Return of the Sap which goes up from the old Root, and this Return of Sap must be constant, as the Growth of this new Root is constant : For was this new Root to be nourish'd only at set Times, it would lose in the Intervals what it gain'd at the Times of its Nourishment ; but Experience shews us the contrary.

Thirdly, This new Root grows till the Flower and Seed is perfected, and then the old Root is quite decay'd, the Flower-Stalk dries, and parts from the new Root without Difficulty, which it will not do while the Stalk is green and the Juices flowing in it.

Fourthly, We are to observe, that it is from the new Root we are to expect the Change or Alteration in the Stripes of the Flower ; and though the Root we put into the Earth for Blowing this Year, should bring a plain Flower, yet, by the Want of Nourishment which may happen to it by being planted in Brick, Lime, or Stone Rubbish, the Parts which are fram'd in the new Root may be so modell'd as to bring its Flower into Stripes the next Year. Therefore when we plant plain Tulips
in

in Rubbish; to make them break into Colours, we must not expect to see any Alteration the first Year, for it is the new Roots, that are form'd in the Rubbish Soil, that must blow to shew the Effect of Planting in such a Soil. The old Roots had already in them their Properties fix'd before we put them into the Ground, which could admit of no Alteration but of Blowing taller or lower, as they had more or less Nourishment from the Soil they were planted to blow in.

But it may be, perhaps, that some of the Tulip-Roots which we planted last *September*, might bring striped Blossoms this Year; but then we have good Reason to suppose, that those Stripes were regulated in the Roots that were made the Year before.

It is observable, that some Tulips, already broke or come to strike, will one Year abound in the dark Colours, and the next Year will come finely mark'd, as that Tulip which is call'd the *Vulcan* will do. I conceive therefore, that while a Tulip blows with a very large Share of the dark Colours, the new Root has imbibed a large Share of those Juices which will afford the brighter Colours, and so on the contrary; for in those Tulips which are call'd Breeders, I observe that the Mass of Colour in their Flowers, before they break, is a Compound of several Colours which simply appear in their Stripes when they come to break; and that these Breeders cannot break into any Stripe of Colour but what is of one or more of the Colours which make the Compound Mass in their plain Flowers. As for Example:

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The *Bagget Primo*, which is counted one of the best breeding Tulips, brings its plain Blossoms of a pale Purple, wherein is a large Share of White, a moderate Share of a deep Lake Colour, and a small Share of Blue. These three Colours rightly blended together, will make exactly the Colour of the Flower of this *Bagget*. And when this Flower comes to break and stripe, which happens from these Colours being separated, then the Stripes are always of those Colours which were used to make the Compound Colour in the plain Flower of that Sort.

When the Lake is quite alone, it shews its Gaiety; when mix'd with a great share of Blue, 'tis much darker; when with a great Share of White, of a Flesh Colour; and the Blue and White brings a Sky Colour; and so the Stripes will produce as much Variety as can be made from mixing these Colours in different Proportions with one another. The Reason why these Colours come to be separated, seems to be from the Structure of the Vessels which are form'd in the new Root, some being made in such a Manner as to receive only such Juices as will yield one Colour, and another such as will yield another Colour, just like the Vessels in Animal Bodies; some yielding Red, as in the Veins; some White Liquor, such as Milk in the Breasts; and others, such as are of the Colour of Urine. Now, I say, it is as plain, that there are Vessels in Plants for the Circulating and Secreting of Juices, as that there are Vessels in Animals which distribute and separate Juices in every Part of their Bodies.

It also seems necessary that this Circulation of Juices should be continu'd in the Tulip 'till it has perform'd all its Offices, such as perfecting its Flower-Stalk, its Leaves, its Flower, &c. for the better adapting the new-forming Root to the same Mode of Growth, and imprinting in it every Natural Perfection of the Original it took its Rise from; therefore I suppose it is that the new Root continues growing all the Time that the old one is performing its Offices, that the Principles of every Part may circulate through it.

But the next Breeding-Tulip which I shall take notice of, is that which is call'd the *Beau Regard*, which is of a much paler Purple than the *Bagget Primo*; its Mass of Colour is compos'd of a very small Share of Blue, a great deal of White, and about as much of the deep Lake Colour as of Blue. This Flower, when it comes to stripe, shews the Colours separately, that the plain Flowers are compos'd of, as the *Bagget Primo* has done before.

The Breeder which is call'd *Van Porter*, has its plain Flowers of a reddish Purple, where the Lake prevails more than the Blue, and there is less White than Blue; the various Colours which may be produc'd from these three Colours, may be expected in those of this Sort which become striped.

The great *Dutch Red Breeder*, with the Black Bottom, has its plain Flowers of a dirty Red Colour, tho' compos'd of two Colours, which are separately as beautiful as can be imagin'd, a fine Yellow, like that of Gamboge, and a Carmine Colour, make this unpleasant Mass of Colour; but when this Flower stripes,
and

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and the Colours are somewhat separated, the Variegations are extreamly fine.

The *Dutch Red Breeder*, with a Yellow Bottom, is of a darker Colour than the former; the Colours which compose the Mass are such as make the former; but in this there is a little Black intermix'd, and when it breaks, its Stripes partake only of the Colours in the Mass, either Simple or Compound, like the others before-mention'd.

We observe sometimes that the White is very prevalling in a Flower when it breaks; and spotted only here and there with other Colours, which were blended in the Mass of the plain Breeder; one may then not unreasonably suppose that the new-forming Root possesses those Juices which make the darker Colours, and will shew them in its Flower the following Year.

Having now gone through my Observations concerning the Growth of Tulips, I shall recommend to your Tryal a Thought (or two) how to make the Colours separate in plain Tulips, and bring those Stripes which make them so much admired: And that the Colours of the Flowers circulate with the Juices all over the Plant, seems certain to me, because of those green Leaves which are now and then, upon certain Occasions, ring'd with Scarlet, Yellow, and other Colours, only common to the Flowers on whose Stalks they are found. And that these Colours, or their Rudiments, likewise circulate thro' the new Root in some Proportion, is evident; because that Root produces Flowers partaking of the same Colours of the Flower produced by the old Root.

As the Vessels which correspond between the old Root and the Flower, and from the Flower to the new Root, are all of them in the Flower-Stem, I am of Opinion, if we could pinch some of them without wounding them all, or arrest the Sap, so that it should not circulate with its wonted Freedom, then I suppose that the new-forming Root would by such Checks be brought to separate its Colours in such a Manner as to produce Stripes of those Simple Colours that compos'd the Compound Colour in the Mass. One Way of doing this may be by binding the Flower-Stem pretty hard with Packthread a little before the Flower opens; for this Binding will, in my Opinion, either press or wound some of the Sap Vessels so much, that the Course of Sap will be prevented in them, and the new-forming Root by that Want will become varied from the old Root; or if by a fine Lancet one could cut a few of them, it might perhaps have a good Effect; but whether they would not heal or close again, I am in some Doubt. The Vessels I would advise to be cut, lie just within the thin Skin of the Flower-Stem; but I think the pinching of them with Packthread is the surer Way.

There has been many Trials made to alter the Colours and Properties of Tulips; as the steeping the Roots in Liquors of several Colours, and the putting into the Cloves of the Roots the Powders of several Colours; and the Planting them in colour'd Earth: But these Trials have all prov'd vain, as well as that of Drawing colour'd Silks of several Sorts thro' the Roots to stripe their Flowers.

The

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The Experiment which I propose cannot hurt any of your Roots.

We may also observe, that now and then we shall find a Root form'd upon the Flower-Stem an Inch or two above Ground, which seems to discover that in that Flower-Stem are Principles of all the Parts that belong to a Tulip-Plant, and those could not all be in that Part unless the Sap circulated throughout the whole Plant.

I shall conclude this Letter with an Observation made by *Charles Dubois*, Esq; who, in his Gardens at *Mitcham*, shew'd me a ready Proof of the Sap's Circulation in the great Garden-Spurge, which immediately, upon cutting off a little Shoot, the wounded Vessels in the Stalk emit so large a Quantity of milky Juice, that it continues dropping for near two Minutes, till the Air and Sun thickens it so much that it stops the Mouths of the wounded Vessels. And that this Sap flows thro' Vessels which have their Rise in the Root, and have a Correspondence with others which return, is evident in the Leaves of a Plant without the Help of a Microscope; but especially if we cut one of the Leaves a-cross with Scissers, the Milk will immediately shew it self at the Mouths of those Vessels which are wounded.

The *Apocinum* or *Dog's-Bane-Tribe*, which have milky Juices, will also shew us the same Thing, especially those which have the largest Leaves, and are the quickest Growers; and I am apt to think that some of them have Leaves transparent enough for us to discern the Milk circulating through them, as we do

the Blood in the webb'd Part of a Frog's Foot or Fishes Tail ; but the Leaf we examine must be growing upon the Plant while we make the Observation, and the Microscope fix'd in some Frame to be kept steady ; we may also use a Lamp to help the Discovery.

The Vessels which serve to convey this Juice through the Leaves of Plants, may be easily observ'd on the Back of the Fig-Tree Leaf, where we shall find that they are all branched into one another ; and what Sap flows through one, corresponds with all the rest ; so that the Juice which comes into the Vessels in the Leaf, thro' some of the Pipes or Vessels in the Foot-Stalk, circulates thro' all the Vessels in the Leaf, as well downwards as upwards, as the following Experiment will demonstrate. If we cut or stamp a small Hole between any two of the Capital Vessels in the Leaf, we shall find the White Sap flow from the wounded Vessels on one Side, or about half the Circumference of the Hole we have cut ; but rarely will it issue from the other Vessels that are wounded, because the Communication is broken ; but if we make several of these small Holes in a Leaf, without cutting the larger Vessels, we shall find the Vessels in some flinging out Juice towards the Root of the Leaf, and some flowing with Juices from the Foot-Stalk towards the upper-part of the Leaf, so that the Sap is running through all the Branches of the Vessels, whether up or down, at the same Time ; and the Plant is increas'd in Bulk, by taking into all its Parts
such

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such Shares of the Circulating Juices as each is appointed to receive.

I am, Sir,

Your most humble Servant,

R. Bradley.

From the foregoing Observations we may judge, that as in Animal Bodies there are several Degrees of Juices, which are more or less refin'd, according to the Largeness or Smallness, or perhaps Figure of the Vessels they pass through; so in Plants we find Vessels of different Functions, which, like Filters of different Kinds, separate and alter the Juices which pass through them, so that they may separately be distinguish'd by the Senses, although they all originally proceed from the same Fund of undigested Juice in the Root; and the more Time these Juices have to open and nourish the several Parts they pass through, so both the Parts and Juices become more perfect, and draw nearer the Point of Maturity, which Nature has fix'd for their Perfection. In this Progress those Parts equally ripen, which are to be acted upon, as those do which are to act.

It is necessary to observe in this Place, that raw undigested Juices in Plants do not reside in bearing Branches of Trees, so that in such Cions as we use for grafting, we should always chuse those whose Juices are in a bearing Condition; and so when we expect Plants to bear

X 4

quickly

quickly from Layers, those Layers must be raised from Shoots which come from Wood where the Juices are digested and ripen'd.

But some may object, that all Plants cannot be raised by Layers, and if even grafting on the Roots of other Plants would do to propagate Trees, yet those Roots so grafted would not perhaps have Sap in them sufficiently disposed to bring the Grafts to speedy Bearing. But in answer to this, we are only to consider the Roots, which we use for this Purpose, as so many Funds of Vegetable Matter, which is to be filter'd thro' the Vessels of the Cions, and digested and brought to Maturity, as the Time of Growth in the Vessels in the Cion direct; for a Cion of one kind grafted upon a Tree of another sort, may be said rather to take Root in the Tree it is grafted on, than unite it self with it; for we see the Cion preserves its natural Purity and Intent, though it feeds or is nourish'd from a meer Crab, which is certainly occasion'd by the difference of the Vessels in the Cion from those in the Stock: And therefore we may compare Grafting very justly to Planting. A Dozen of Heart Cherry-Trees, for Example, planted in as many different Soils, each of those Trees, tho' the Juices of those Soils are all different, will yet preserve its natural Bent of bearing Heart Cherries: Or do the Physicians always take Notice, that any particular Herb alters its Virtue for being cultivated either in Sand, Clay, Gravel, or any other kind of Land; generally supposing that the Strainers of every distinct Species of Plant so modify the Juices of the Earth it grows in, as to afford the same

Virtues

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Virtues in all of one sort, let the Soil be never so different.

In Dr. Grew's and Malpighius's *Anatomy of Plants*, as well as in those Plants I have traced with the Microscope, one may discover Parts in each distinct Plant, of very different Frame and Texture from one another; and then we may as surely conclude, that those Parts differing from one another, are design'd by Nature for different Functions; for it would be as unreasonable to suggest, that all the Parts of a Plant do the same Office, as it would be to suppose, that a Bone acted the same Part as an Artery, an Artery as a Muscle, a Muscle as a Vein, or a Vein as the Lungs of any Animal; and, in my Opinion, there is nothing more necessary than a right Understanding of the Anatomy of Plants, for those who would cultivate them; for how would it be possible for a Physician to cure the Distempers incident to Humane Bodies, or prescribe them Rules of Health, unless he first knew their Frame and Constitution.

Among Plants it must be as impossible to improve their Growth, or give them (or preserve in them) a State of Health, as in the Case of Animals, if we do not consult their Frame and Texture of Parts, and the natural Food or Soil they require; it is therefore I shall take Occasion to hint some few Remarks relating to the Parts which are generally observed in them.

Dr. Grew tells us, all kinds of Vegetable Principles are at first receiv'd together into a Plant, but are afterwards separated, *i. e.* filter'd, some from others, in very different Proportion

portions and Conjunctions by the several Parts ; so is every Part the Receptacle of a Liquor, become peculiar not by any Transformation, but only the Percolation of Parts out of the common Mass or Stock of Sap ; and those which are superfluous in any Plant, are discharg'd back by Perspiration.

The same learned Doctor ascribes to every different kind of Vessel a distinct Office : He tells us, the *Lymphæducts*, which carry the most watry Liquor, are placed on the inner Verge of the Bark, next to those which he calls Air-Vessels, I suppose from their smallness, which will not admit the Passage of any Fluid denser than Air. He adds, the Lactiferous or Resiniferous Vessels do usually stand in the Middle between the inner and outer Verges of the Bark : His *Lymphæducts*, I suppose, are what I call the new-forming Vessels, which are produc'd annually, and help to encrease the Bulk of the Tree. The Lactiferous and Resiniferous Vessels, I suppose, serve to return the superfluous Sap, as I have already hinted in the first Chapter of my *New Improvements of Gardening*, and in a Memorial which I deliver'd to the *Royal Society* about three Years since, concerning the Vessels which run longitudinally in the young Shoots of an Apple-Tree, and has since been publish'd in the *Philosophical Transactions*, with a Figure done with the Microscope.

But to give a better Idea of those Vessels which convey and filter the several Juices in a Tree, I shall here give my Reader a View of a Vine-Shoot of one Year cut horizontally, as I observ'd it with the Microscope ;
the

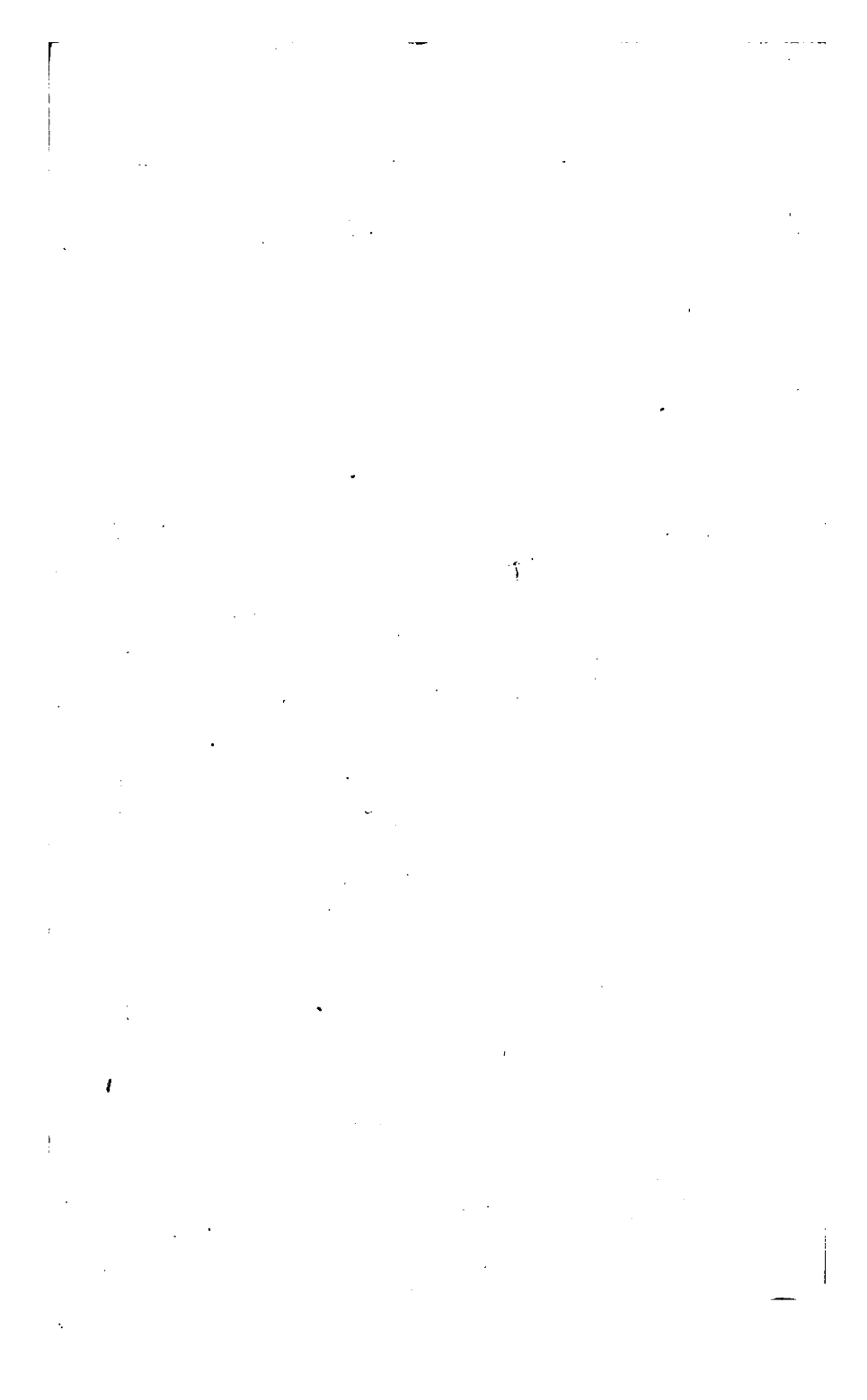


Fig. I

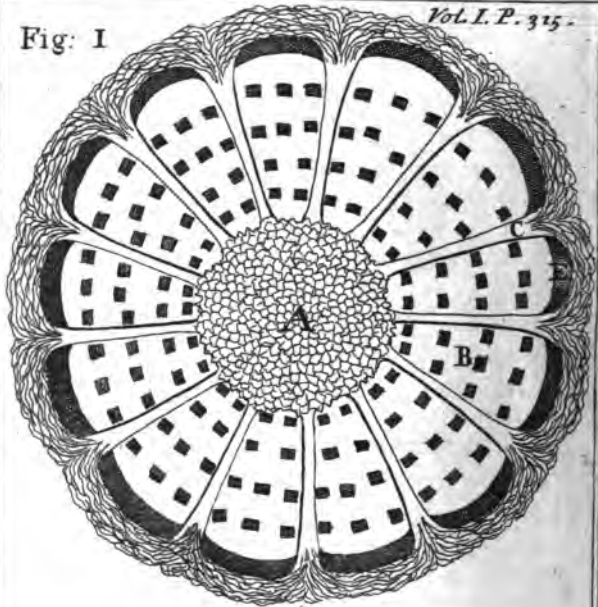
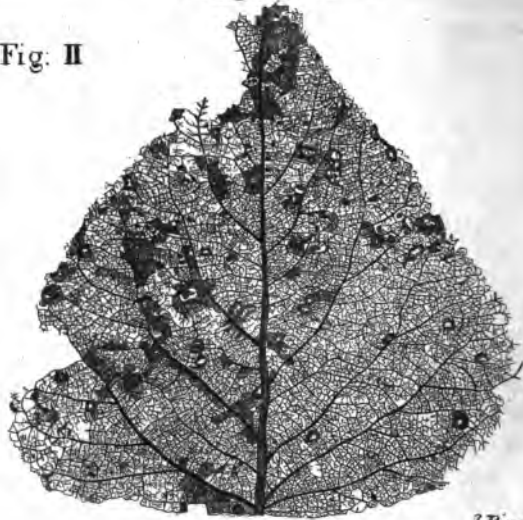


Fig. II



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the Diameter of the Shoot, without the Glass, measur'd one third of an Inch.

Fig. I. The Circle A represents the Pith, from the extreme Parts of which we observe thirteen Latitudinal Vessels, which have a Communication with the Bark; one of them is mark'd C, which loses it self in D or the Bark, which seems to be compos'd of fine Capillary Vessels. I observ'd that the Vessels mark'd C were not at equal Distance one from another, which make the Spaces between them B of irregular Figure. In each Space B, we find four Rows of Spots of unequal Forms and Magnitudes, the two Rows next the outer Verge have constantly three Spots in each Line, but those next the Pith only two apiece: These Spots represent the Orifices of the Longitudinal or Air Vessels, as Dr. Grew calls them, which run through the woody Part, and which, I suppose, filter the finer Juices of the Plant. At E we discover some Passages capable of containing Liquor as dense as Water; these, I suppose, serve to return the superfluous Sap to the Root, and, I suppose, are Dr. Grew's *Lymphæducts*.

When we have observ'd this Figure of the Wood, I conceive it will not be improper to give my Reader a View of the beautiful Texture of a Leaf, as it was dissected by the Insects which blighted it; which were so small that they were only capable of eating the most tender Parts, and leaving such minute Vessels untouch'd, as are scarce discernable without a Microscope; so that 'tis easy to guess at
the

the extreme smallness of the Insects which fed upon this Leaf, and which, at some other Opportunity, I shall describe in a more particular Manner.

Fig. II. Shews us the Texture of a full-grown Leaf of the Lime-Tree, whose fleshy Part was destroy'd by small Insects. In this we may not only observe the Ramifications of the Sap Vessels, which hold a close Communication with each other, but in several Places discover the Egg-Nests of the Insects which devour'd the fleshy Parts. Dr. Grew observes, that the Fibres of a Leaf are composed of the two general Kinds of Vessels, viz. for Sap and Air; and these, as well as other Vessels in Plants, are ramified out of greater into less, as Veins and Arteries are in Animals. It is likewise the Opinion of some great Men, that the Vessels in the Leaves of Plants are inosculated not Side to Side, but the Ends of some into the Sides of others; but this is not really done, the smaller Threads being only so far deducted as sometimes to stand at right Angles with the greater, so that they are only inosculated End to End, or Mouth to Mouth, after they are come at last to their final Distribution.

It is to be observ'd farther, that the Vessels are the chief *Viscera* of a Plant; and as it has several Liquors, those Liquors become differently qualified from the divers Kinds of Vessels; and that as the *Viscera* of an Animal are but Vessels conglomerated, so the Vessels of a Plant are *Viscera* drawn out at length.

Moreover,

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Moreover, it is remarkable in many Cases, that the multitude and largeness of the Vessels produce a sweet and winey Sap, and the fewness and smallness of the Vessels an oily Aromatick. Dr. *Grew* supposes, that the Odours in Plants proceed chiefly from the Air Vessels in the Wood; not but that the other do also yield their Smells, which is most perceptible in fresh, undry'd, and unbruised Plants: For, says he, the Air bringing a Tincture from the Root, and from the several Organical Parts along with it, and at last entering the Concave of the Air Vessels, it there exists. It is not to be deny'd, that the *Effluvia*, which can be admitted into the Wood Vessels, may give a Smell to the Wood, and that as that Vapour passes through Vessels of different Structure, so as to alter the Form of its Parts, so in every one of its Changes it will yield a Smell different from the rest: The Smell of the Wood will be different from that in the Bark, the Juices in the one being more essential than the other; but both being bruised and mixed together, yield a Scent differing from either of them singly. So the Leaves give us a Scent different from either of the former, as the Flowers do from that in the Leaves, and the Fruit from that of the Flowers. It is necessary, moreover, to the Nutrition of Plants, as in Animals, that there should be a Concurrence of two specifically distinct Fluids: These, says a learned Author, with good Reason, are interwoven in every Part of a Tree in their proper Vessels, like *Linsy-Wolsey*; so that every the least Part of Sap

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is impregnate with divers essential Tinctures, as it is continually filter'd from the Fibres of one Kind to those of another. We may observe in Figure the First, very plainly, the Insertions of the Cortical Body as they run from the Centre to the Circumference, which in other Subjects are visibly braced and interwoven together by Capillary Tubes with the Longitudinal Vessels of the Wood, and by that Means constitute a firm Body, as the Timber of any Tree.

From hence we do not only learn, that in all Plants there is a Necessity of two specifically distinct Juices to act upon one another, but that these in their Action are filter'd or refin'd, alter'd and chang'd, according to the Parts they pass through, and also that in some Parts they sooner ripen and become prolifick than in others; they are also more grateful to the Smell in some Parts than in others: Nor is this all; this mixing, filtering and ripening, sooner or later, of the Juices, gives Difference of Colour to the several Parts of the Plant, and is seemingly the Occasion of most of the Alterations which we find in the several Parts of Trees.

Dr. *Grew* supposes the chief governing Principle in the Juices of Plants to be the Saline; which Saline Principle he tells us must be understood as a Generick Term, under which divers Species are comprehended. The Vegetable Salts seem to be four, *viz.* the Nitrous and Acid, Alkaline and a Marine; arguing, first, from the Cuticular and other Concretion, commonly call'd Moldiness or Mether, in Liquors distill'd from Herbs, Vinegar, and

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and such-like ; for in these, says he, there is a Tendency to Vegetation, and many of them are true Vegetables, as Dr. Hook has observ'd in his *Micrographia*, and has been confirm'd by others. Now the Liquors where these are found, do wholly, or in part, lose their Taste and Smell, and become Vapid, the more sensible Principles therein having made their Transit from the Fluid into the concrete Parts.

But in a more particular manner my Author observes, the Nitrous Salts seem to be assign'd by Nature chiefly for the Growth of Plants ; the other three Salts are exhibited by the several Ways of resolving the Principles of a Plant, some in their natural State yield an Acid Juice, others by Fermentation, and most by Distillation in a sand Furnace, yield an acid Liquor.

By Calcination, all Plants yield more or less both of a fix'd and volatile alkalous Salt, the first in the Ashes, the latter in the Soot ; but the Marine Salt is obtain'd no other way but from a Solution of the Alkaline upon its being expos'd to the Air.

The Diversity of Salts found in one Plant serves not only as a Proof of what has been related above, but has given the Hint to Physicians, of using sometimes one Part of a Plant, and sometimes another, as the Case of their Patient requir'd : The Root is serviceable on some Accounts, the Bark in others, the Wood in others ; the Flowers, Fruit, and the naked Seeds, have all their several distinct Virtues. But because it is not in every ones way to extract the Salts from Plants, as has been
been

been related, I shall here insert a Method prescrib'd to know what Salt is most prevailing in every Plant, but chiefly in their flowering Parts, which perhaps may be worth the Trial of the Curious, but I have not yet had an Opportunity to try it; for could we once judge rightly of the Quantity of each respective Salt residing in a Plant, we might have a surer Guess at the Manner proper to improve their Vegetation, which is the Point we are now upon.



Table



*Table of Experiments recommended by
Dr. Grew.*

S *Accharum Saturni* drop'd on a Tincture of Red Roses makes a faint pale Green.

Salt of Tartar upon the same, a deeper Green.

Spirit of Hartshorn on the Tincture of Burage and Larkheel Flowers, makes a Verdigrase Green.

The same Spirit upon green Leaves does not change them ; which seems to intimate, that some Alkaline Salt in the Air is predominant in the Production of Green in Plants.

Salt of Tartar on White Daisy Flowers, changes them to a light Green.

Spirit of Sulphur on green Leaves of Adonis Flower, Everlasting Pease, Holy-oak, changes them yellow.

Spirit of Sulphur on the yellow Flower of Crow-foot, alters not. And the Doctor observes, that in Yellows the Sulphureous Acid and Alkaline Parts are all more equal ; but I rather think they consist chiefly of Sulphur, because Sulphur with Sulphur can produce no Change.

Spirit of Sulphur on Tincture of Clove-gillyflower makes a bright Blood Red ; so that

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as Alkalies or other analogous Salts are predominant in Greens, Acids are in Red.

Spirit of Sulphur on Tincture of Violets, turns it from Blue to a true Lake or middle Crimfon.

When Sulphur and the Alkaline Salts are more equal, they produce Tawny.

When Sulphur, Acid and Alkaline, Yellow.

When Sulphur is predominant, and the Acid and Alkaline equal, they produce Blue.

When Sulphur and Acid are predominant to the Alkaline, then Purple.

When Sulphur is predominant to the Alkaline, and the Acid to them both, then Scarlet.

When Acid is predominant to the Alkaline, and Sulphur to both, then Blood Red.

To give my Reader some further Hints relating to the Colours observable in Plants, I shall insert the Copy of a Letter which I writ to my learned and ingenious Friend the late Mr. *James Petiver*, F. R. S. *Anno* 1717, which more especially I chuse to do in this Place because it relates to some Experiments I have already made, and to some others which I think may be necessary to make, towards finding out the essential Parts of Plants, and may lead us more precisely into the way of improving their Growth.

To



To Mr. James Petiver, F. R. S.

S I R,

Among the many Enquiries which have been made (by the Learned) into the mysterious Order of Nature's Works, I have not found any Reason given for the Diversity of Colour in the Leaves and Flowers, &c. of Plants; nor dare I presume to resolve so great a Question, but shall only give some Hints which I believe may be serviceable towards the forwarding this great Discovery.

It will be proper in the first Place to consider the Nature of Colours in general, and after what manner the several Parts of it are form'd; and in the next Place we ought to examine the Disposition and Order of the Vessels in Plants: And, lastly, we must consider what Proportions the Vessels of each Plant bears to the Colours produced by them.

And, first, touching Colour in general: We are sensible it appears in all sorts of Bodies; as, in Flowers, Fruit, Minerals, Clouds, in the Rainbow, in the Shells and Scales of Fishes, and Insects, in the Hair of Beasts, and in the Plumes of Birds: In a word, there is not any thing that is not of some Colour. It has been customary to give the first Place to White,

above all the rest, and the last to Black, as esteeming them to be the two Extremities of Colour; the first represents Light, Joy, Life, and Action, and the other Darkness, Sorrow, Death, and Repose.

Aristotle tells us that Light is the Origin of Colours; and, says he, they have no ways any relation to the Temperature of Bodies: For Example, White is as well seen in cold as hot Subjects; for Snow is cold, and Lime is hot and dry; Milk is liquid, and Flower or Meal is dry: So that according to his Opinion, Colour does not depend upon the first Qualities, but simply on the Figure and Order of the Parts; from whence, if their Corpuscula's be Spherical, they produce White, and if they be Triangular, they produce Black. We may observe that White is much brighter, as it is produced by a greater Quantity of Rays, and Black is so much more obscure as it has less Rays. The Medium Colour between these two Extremes is Red, because it contains as much Force of the one as of the other; for Yellow contains more of the White, and Blue more of the Black. Green is a Compound of Yellow and Blue; for if we lay a Piece of Blue Glass upon another Piece that is Yellow, and so place them between the Eye and the Objects, whatever is seen through them will appear Green; but other Colours do not seem so inclinable to unite as Blue and Yellow; and there is good Reason for it, because the Parts are different in Proportion in all other such like Mixtures; and so long as there is any one Colour predominant, there can be no Union.

Father

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Father *Niceron* tells us that Red is produced by an equal Interruption and Continuation of Rays, as if we were to suppose three continued Rays and three Points of the Object which were dark. And this Supposition might give us to believe, that all Colours were composed of White and Black; that is to say, of certain Proportions of Light and Darknes, or of a Being. And nothing Yellow is equally distant from White and Red, as Blue is from Red and Black; but the Difference of these may be better explain'd by the following Table.

| | | |
|---|--|---|
| White has 100 Rays of Light. | Red compo- sed of equal Parts of White and Black, or of 50 Rays and 50 Points. | Black 100 Angles or Points of Darknes. |
| Yellow has 75 Rays and 25 Points. | Blue has 75 Points and 25 Rays. | |
| | Green the Medium of Blue and Yellow. | |

Sanctorius makes all Colours to proceed from Shade and Temperance, and gives us an Experiment to prove that Black and White are each of them made up of transparent Globes; and those which give us the Black he thinks to be fill'd with Matter, and those which produce White, to be void and empty. The first

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gives Shade, and the second containing only Air, gives none; for Air and such like subtile Bodies make no Refraction.

Supposing all bright Colours to be composed of spherical Particles, then we may reasonably imagine the brightest sorts of them to consist of smaller Globes than those which are more faint; because we know, says *Sanctorius*, that in all transparent Bodies of this Form, every single Globe will at least send one Ray to the Eye; and so the more these are of these Rays, so much the more such Colours come nearer to Light it self, which is more dazling, as these Parts are more subtile and refin'd. And so the darker Colours become more sensibly obscure, as they are composed either of more Triangular Parts; or as the Parts that compose them tend more towards the last conceivable Point of Magnitude.

I would not be supposed here to fix the Points of those two extreme Colours, White and Black, or as one may term them, Light and Darkness, or to suppose they can extend no farther than the Bounds of our Sight; for there are many ways to prove they are more extensive and boundless than the common Sight can discern. And it would be to abridge the Power of Eternity, which by continual Progression in Greatness and Smallness, traces mysterious Vastes better conceiv'd than express'd; and which, as they move farther from the Limits of our Understanding thro' the unbounded Space of Eternity, leave our Thoughts in Amaze, and lost in their own presumptuous Searches.

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We may observe, that by Filtration Colours are chang'd, for every Filter gives its own Form to the Parts of whatever Body passes through it ; so that every Colour, if we allow it to be Material, is alter'd by changing the Figure of those Parts, which composed it. White-wine becomes Red in the Veins, and Blood passing through the minute Vessels in the Breasts, becomes White. And again, Red Wine becomes White by Distillation. From whence I conclude, that the Difference of Colour in the several Parts of Plants, is partly, if not altogether, produced from the Alteration of the Parts of the vegetable Juices, by filtering through the Vessels or Tubes of different Frame and Magnitude. We may farther observe, that Heat and Cold are the necessary Results of Light and Darkness, whose more moderate Points are Yellow and Blue ; which together produce Green, which seems to be the most prevailing Colour upon Earth.

It is remarkable, that in the growing of Plants, the same Shoots alter and change their Colours from Time to Time, as the Vessels in those Shoots grow larger : When they are in the smaller State, the Leaves are of a faint Yellow, which in their middle State becomes a bright Green, or sometimes Red, and when these Vessels are enlarg'd to their full Point of Growth, they are of a dark Green, and so towards the Autumn change to a *Feule mort* Colour, from the ripening of the Juices ; from thence to Putrefaction, which resolves it again into Earth, its first Principle.

We may likewise examine, whether Plants which naturally grow in dry Places, and lie exposed to the open Sun, do not yield the brighter Colours, or those of the lighter sort. And whether, on the contrary, such as inhabit the most shady Places, are not commonly much deeper in the Green of their Leaves, and endued with more Acid Qualities.

Before I conclude, I cannot help observing to you, that many Colours are prepared by Corrosion of Minerals, as Lead made into White, call'd *Seruss*; Iron into Yellow, call'd *Crocus Martis*; Quicksilver into Red, call'd *Vermilion*; Brass into Green, call'd *Verdigrease*; Chalk into Blue, call'd *Smalt*, &c. Now, whether these Mineral Bodies, so modell'd, may not be brought to Use in helping such Vegetables as most nearly relate to their several Qualities or Colours, is not altogether unworthy our Enquiry.

I am, Sir,

Yours, &c.

R. Bradley.

From such Enquiries as these I have been led to most of the Experiments I have made concerning the Improvement of Vegetables. I must own indeed, some have miscarried; but to fail sometimes ought not to discourage us in the Search of Knowledge; for though we miss of the desired Success, when we make an Experiment, we always discover something even

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even in the Miscarriage, which improves our Knowledge, and gives us Thoughts which we could never have found without it; just like Conversation, which tho' it may not happen sometimes to be directly answering our Purpose, yet may drop us some Hints, which perhaps in greater Things may stand as Chiefs in our Argument. I was therefore the more encourag'd to give the foregoing Specimen of a Table of Colours; because, was it to be improv'd, or something like it divided gradually, and mark'd out to shew the several Proportions and Distinctions of Colour in its Progress from the most intelligible White to the darkest Black; one might from such a Scale describe more exactly the Colours of Plants, Animals, or other Bodies subject to Natural History, than has been done hitherto.

I should in the next Place introduce an Account how the Generation of Plants is perform'd in a particular Manner; but as that is already done in my *New Improvements of Planting and Gardening*, I refer my Reader to that Account, and shall only give him, *En passant*, two or three New Observations upon that Head in the following Letters.



Remarks



*Remarks concerning the Generation of
Plants, with some Conjectures relating
to the assisting of Vegetation by Honey.*

To Mr. BRADLEY.

S I R,

O^{ct}ob. 6. 1721.

“ **A**S it was your *New Improvements of Gardening* gave me the first Hint of the
“ Generation of Plants, I shall take this Opportunity of acquainting you with the Experiment I have made on that Subject.

“ It is now about two Years since I sav’d
“ a large Piece of Spinage for Seed ; and,
“ according to the old Way of Gardening, as
“ soon as the Male Plants began to shew themselves, caus’d them to be pluck’d up, in
“ order to give Way to the She-Spinage, as
“ the Gardeners call it, that the Seed might
“ ripen better ; not considering that Nature
“ had ordain’d the one to assist the other.
“ Some of my Friends that saw the Spinage
“ growing, desir’d me to let them have some,
“ and I promis’d I would ; and as soon as I
“ thought the Seed to be ripe, caus’d it to
“ be pluck’d up dry ; and as it was a pulling
“ up, I found there had been some Male
“ Plants left, which might be sufficient to
“ impregnate some of the Female Plants, but
“ not

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“ not all : But I never consider’d of this till
“ some Time after that I sent some Seed to
“ my Friends, who sow’d it all, except one
“ Gentleman, who kept some by him, and
“ sow’d the rest. In a little Time after I
“ heard a great Complaint, that my Spinage-
“ Seed did not grow. Some thought that I
“ had impos’d old Seed on them, but I as-
“ sur’d them I had not : But my Friend who
“ kept some Seed by him, when he found that
“ half his Seed did not grow, told me it had
“ been eat by Mice, but I assur’d him it had
“ not ; and coming home I search’d that Seed
“ I had left by me, and found that half of it
“ had not got the *Punctum Vitæ*, which put
“ me on Consideration how it should come to
“ pass. But Reading your System on the Ge-
“ neration of Plants, gave me a clear insight
“ how it happen’d, it being for want of Male
“ Plants enough to impregnate and give Life
“ to the Seed ; and since I have always a Re-
“ gard to leave enough of the Male Plants,
“ and have had good Success.

“ This put me on trying Experiments, in
“ pulling out the *Apices* in Flowers before
“ they had cast their Dust ; and likewise I told
“ some of my Friends of this System, who
“ would not believe me, but said they would
“ try as well as I ; but to my great Astonish-
“ ment we had some Seed ripen’d very well,
“ having all the good Properties that it should
“ have, which we sow’d, and it grew very well.
“ Hereupon my Friends condemn’d me, and
“ said I had assert’d a mere Fiction ; but I
“ desir’d them to wait till I had try’d again.
“ And accordingly I planted a Dozen of Tulips
“ by

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“ by themselves, and as soon as they open’d,
 “ took out the *Apices* with a fine Pair of Nip-
 “ pers, lest I should shake some of the Dust
 “ off; and by my Microscrope I could not
 “ discern any Dust that had been left behind.
 “ About two Days after, as I was sitting in
 “ my Garden, I perceiv’d, in a Bed of Tulips
 “ near me, some Bees very busy in the Mid-
 “ dle of the Flowers; and viewing them, I
 “ saw them come out with their Legs and
 “ Belly loaded with Dust, and one of them
 “ flew into a Tulip that I had castrated: Up-
 “ on which I took my Microscope, and exa-
 “ mining the Tulip he flew into, found he
 “ had left Dust enough to impregnate the Tu-
 “ lip; which when I told my Friends, they
 “ concluded that theirs might be serv’d so,
 “ and by this Means reconcil’d them again.
 “ But it being probable that some People a-
 “ broad may fall into the same Mistake, and
 “ so condemn this System, I desire you will
 “ publish this; for unless there be Provision
 “ made to keep out Insects, Plants may be im-
 “ pregnated by Insects much smaller than Bees:
 “ For as the Creator of all Things, in his in-
 “ finite Wisdom, appointed this Way of Gene-
 “ ration to Vegetables, which are incapable of
 “ Motion to each other, it may be supposed,
 “ that he had so ordain’d it, that a small Part
 “ of the Male Dust should be sufficient to per-
 “ form that Office; which is all at present,
 “ from

Yours, &c.

Philip Miller.

Con-

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Concerning the Generation of Plants, and which may help to support that Opinion, it is observable, that the Orange-Tree has Male and Female Blossoms; the Male having only the *Stamina* and *Apices*, with their Dust, and the Female Blossoms a large divided *Pistillum*. Further, we may add the Case of the Hermaphrodite Orange, where we find upon the same Tree compleat Oranges, compleat Lemons, and sometimes half an Orange join'd to half a Lemon, and the Orange and Lemon Fruit quarter'd regularly: And with this we may likewise mention the *Switzerland* Grape of my Catalogue, which in some Parts bears Bunches of Black Grapes, in others White Grapes, some Bunches half Black and half White Grapes; and what is more extraordinary; in many Places there are single Grapes striped with Black and White, which Mr. *Fairchild* supposes could in neither of these Cases happen by Graffing; so then the Grape I have mention'd seems to have been thus variegated in its Fruit by the coupling of a White Grape with a Black Grape.

The Observation of Insects carrying the Male Dust from Flower to Flower, and thereby impregnating some that would otherwise have never been prolifick, is a Thought entirely new, and seems reasonable; and Mr. *Miller* is as right, in my Judgment, concerning what he relates of the Male Spinage Plants, whose Dust Nature surely designs to impregnate the Seed in the Female; and therefore 'tis an Error to pull them up while there is any Dust upon them, or till they have done their Work.

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We may observe in my Papers relating to Bees, that the *Farina* of the Flowers is gather'd by the Bees to make their Wax of; and it is hardly possible that they should shift themselves from Flower to Flower, without leaving here and there some of it in their Progress; and though in the Flowers which Mr. Miller castrated, the Bees could not be invited to them, on Account of the Dust, for Wax, yet we must consider, that these castrated Flowers were not void of that excellent Dew from whence they extract their Honey; and so they visit all alike, and all may be render'd fecund by their Visits.

I have often thought, that there might be some extraordinary Extract drawn from the *Farina* of Plants, to help or forward Vegetation; and one Year I had large Quantities of it gather'd from several Kinds of Plants, in order to try Experiments with. From the White Lilly alone I got about two Pound Weight, and about as much of the Dust of the Yew Tree; about half a Pound of the Dust from the Katkins of the Hazle, and about a Pound of Tulip Dust. My Design was to try them severally in Paste, to see what Effect that would have on the Roots or Seeds of the Plants they come from; also to try what this Dust would do by Infusion, either in the Juice of its Original Plant, or in Rain-water, or by Decoction or Distillation, or by reducing it to Ashes. But these Experiments were lost, with many more, just when they were near being brought about; and I think it may not be unreasonable to imagine, that some Trial or other that I was making with this Dust would

would have produced an extraordinary Event, considering that every Particle of it contains the Sovereign Spirit of Vegetation ; that it is the *Farina fecundans*, that it gives the first Degree or the first Spring of Life to the Seed. I cannot therefore leave my Opinion, that it must be considerably helpful to Vegetation, till we have found the contrary by many Experiments.

The ingenious Mr. Godfrey in *Southampton-street*, whose great Skill in Chymistry is acknowledged by the most famous Artists in *Europe*, I hope will make some Experiments upon this vegetable Matter, he having already observ'd to me, that if we take a little of the Dust of the Katkins or Juli of Hazle, and put it into a Tube, and then blow it with the Mouth thro' the Flame of a Lamp or Candle, it will pass cross a large Room inflam'd ; but this is only one sort of Dust, perhaps the Dust of other Flowers may afford Variety, if we try them this Way.

While I am writing this, I consider that both Wax and Honey, fully prepar'd by the Bees, must be of Use to the Vegetables ; the Wax to be laid to the Roots, or else the Roots to be anointed with Honey, or else both together to be made into a PASTE, will promote Vegetation ; for seeing that Bees-Wax is made of the enlivening Parts of a Plant, *i. e.* the Male Dust, and the Honey is gather'd from an essential Dew which is ever found in or about the Female Parts of Flowers, we may reasonably judge how apt these Bodies, together or asunder, are to help the Growth of Plants, if they are rightly apply'd.

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The Application of Honey to the Roots of Plants, will answer one of the Ends which Soap will do, *viz.* to keep the Roots from shrinking by the Air, till the Earth is well settled about them. And I am of Opinion, from what I have said before, that the Plant anointed with it will gain an extraordinary Benefit by it; for tho' Honey is taken from the most finish'd Part of a Plant, yet, as I have been observing before, the extream Parts of the Roots may be made to become Branches, and the extream Branches to act as Roots: So that 'tis likely that Honey may be serviceable to the Roots of a Plant, tho' it be the Produce of the Extream Parts of the Branches. And as it certainly is helpful to the perfecting of the Seed, and fills (as I believe) the Lobes of every Seed with nutrimental Juices, for the Subsistence of the Embrio of a Plant in the Seed; so, I say, we may suppose that Honey must assist the Growth of a Plant, being apply'd to the Root.

But, before we go too rashly to work, let us consider whether every sort of Honey will do for our Purpose; for if the Bees gather it from the Flowers of Heath, or Furze, or Broom, or Pease, or Beans, or from Garden Flowers, the Query is, Whether it will be alike useful to every sort of Tree? And if we should be so nice as to examine the Country about us, what chiefly is in Flower, and judge from thence what sort of Plant the Bees gather their Honey or Wax from, that Honey, I presume, will be of Use chiefly to promote the Vegetation of Plants of the same Kind rather than others; though I conceive it will be
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of great Help to Plants of any sort, and enrich their Growth, as it depends upon natural Principles of Vegetation, which are generally the same ; but perhaps the Honey gather'd from Tulips would be of the most Service to Tulips, that gather'd from Pease to Pease, and so on. But this Honey, however the Plants it was gather'd from were differing from Trees, yet there cannot be any thing in it disagreeable to the Laws of Vegetation ; so I question not but if the Wax made at the Time when either the Oak, the Chesnut, or other Trees were in Flower, or the Honey, if the Bees can gather any from Trees, that Wax or Honey would be sovereign if we were to enclose the Seeds or Mast of the same Trees in it when we set them in the Ground ; the Wax having in it the Substance of the Male Spirits, which first endued that Seed with the Spirit of Vegetation, the Honey partaking of that Dew found in the Female Flowers, which was essential to the Growth of the *Plantula* in the Seed.





*Of the Generation of the Fig within
the Fruit, with other Curiosities re-
lating to the Fig-Tree, in a Letter to
J. C. Esq;*

S I R,

THE last Time I saw you I remember
our Conversation was bent upon the
Cultivation of the Fig-Tree, a Subject which
has been very rarely touch'd upon by Au-
thors, and as rarely look'd into by our Gar-
deners ; for Figs, however excellent they
are, have not yet so thoroughly gain'd upon
the *English* Palate as to be generally admi-
red.

The Reason perhaps may be, because only
one or two of the most indifferent Sorts has
been in common with us ; or else that where
some of the better Kinds have been planted,
the want of Skill in their Management may
have either render'd them barren, or made
them bring their young Fruit at such Seasons
when our Climate could not ripen them :
But that every one who are yet ignorant of
the Excellence of Figs may have it in their
Power to be as much regaled with them as
those

those Gentlemen who have eaten them Abroad, I shall give you my Thoughts of a Figury or Fig Plantation in this publick Manner.

To begin with the Fruit it self; it has been supposed generally to bring no Blossom, and it has raised Wonder in many ingenious Men: Neither the Ancients or Moderns have accounted for this Phænomenon, till Monsieur *Jeoffroy*, a curious Physician at *Paris*, took it in hand, and his Undertaking has shewn him to be no less curious in his Enquiry than happy in his Judgment.

Upon the Foot of the Discovery of the Generation of Plants, he has, with a great deal of good Reason, consulted the Nature of the Fig; he has examin'd the Fruit at different Seasons, and at different Stages of Growth, 'till at length he discover'd the Clue to that dark Passage in Nature, and has unravel'd the Mystery to us.

The Fig Fruit, he observes, is not only a Nest of little Fruit disposed withinside of the Skin, but every Seed or Fruit therein has all its Female Parts of Generation, as much as if it were a Capital Flower; and every one of these is so placed that the Hollow in the Center of the Fruit is large enough to permit every one to receive the *Farina fecundans*, which may be flung upon them by the *Apices* or Male Parts which lie in the upper Part of the Fruit; and he is yet so exact to mark us out those Parts which do the Office of *Petals* or Flower-Leaves above the *Apices* to preserve them from the Weather.

ther. This Gentleman has join'd a very accurate Cutt of all the Parts of this Fruit, done with a Microscope, at the End of a Memoir he deliver'd at the Royal Academy of *Paris*, which was publish'd about four Years ago.

The Objections which had been made to me by some People, upon Mr. *Jeoffroy's* Observations, are trifling; for as they say they observ'd the Fruit only when it was ripe for the Table, they could not then certainly find the *Aices* he mentions; for 'tis a Thought as absurd as for a Painter to paint every sort of Tree or Herb with the Flower or Fruit growing upon it at the same Time. This is no more natural than what I have observ'd in some Pictures well painted, where the Fruits or Flowers of the four Seasons have been jumbled together.

In the present Case we must consider, that every one of the little Seeds in the Fig is a distinct Fruit, and, as has been observ'd, has Parts common and natural to other Fruits; if the Male Parts, or such as give them the impregnating Dust, are a little remote from them, this is no more, nor so much as we may observe in many other Cases; and when a Fruit is full ripe, it would be a Jest to look for the Blossom.

The Oak has its Katkins or Juli remote from the Fruit Buds, the Chesnut the same, the Willow the same; the Aspin, the Hazle, the Gourd, the Melon, the Cucumber, and many others have the Male Parts of their Blossoms situate at the same Distance from
the

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the Female or Fruit-bearing Parts or Blossoms, tho' many other Fruit-bearing Plants have them constantly together, or in one single Blossom. But as the Fig has its Generation Parts enclosed, so the Strawberry has all its little Fibres open and exposed to the Air: Every little Seed, which is in effect a Fruit, has its Male Parts to impregnate it, and when once that Work is completed, and the Dusty Parts have done their Office, they decay and fall off, and the Fruit remains in a right State of Growth for ripening.

The Mulberry is, in many Respects, of the same Kind, but the Katkins are not so near to the Female Parts of the Blossoms as the *Apices* of the Strawberry; the Mulberry is not one Fruit, but a Bunch of Fruit, for every Knot, as I may call it, of the Mulberry, is only a Part of the Fruit, and that is surely influenced by the *Farina* of the Katkins. Now the Business of Impregnation is no less possible within the Case of the Fig Fruit, than upon the Fruits of the Strawberry or Mulberry. But to leave that Point, let us consider, that there are not less than forty Kinds of Figs in *Europe*, which are in their Turns counted valuable, and many of them are so forward naturally in ripening, or may be made so by Culture, that it is possible to bring a great many Sorts of them to Perfection with us in *England*.

The Way of Planting them is early in the Spring, without letting them be long out of the Ground; for their Roots soon dry, and

then the Parts languish, although the driest rubbish Ground is the most proper for them, or downright Gravel, where this sort of Fruit always does best. When I have a Mind to propagate a Fig, I draw a young Branch through a Pot, as I do the young Shoots of the Vines, and cut them off when a Summer is past, and from the Pots transplant them with the Earth about their Roots in Places agreeable to their Constitution; those which come from the hotter Climates, in the warmest Parts of the Garden, and the rest in Proportion to the Climates they come from; for Vegetables must have their own Way, if we expect them to answer our Designs, as well as Animals, or else we have no Profit from either.

The forward sorts of Figs may be planted in the Natural Ground, and being left at Liberty will bear well; but the late sorts must be forced, by nailing against Walls, to gain us any Fruit at all; and in this last Case especially, the Method of Pruning should be consider'd, and I know not any so agreeable to Reason as what I have observ'd at Mr. Greening's, Nursery-Man at *Brentford*, whose great Curiosity leads him, at any reasonable Expence, to dive into the Secrets of Nature. About the End of *July* he tops the Branches of his Fig-Trees, and thereby not only prevents the Autumn Fruit coming forward against the Winter Season, but prepares his Trees to make good Shoots in the Spring, which bring their Summer Fruit with them. This, Sir, is what my Time will permit me to give you concerning Figs,
and

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and I shall gladly take another Opportunity of communicating to you my other Thoughts upon this Subject.

I am, Sir,

Your most humble Servant,

R. Bradley.

In the next place our young Gardener should take every convenient Opportunity of conversing with ingenious Men, as well in the Art of Husbandry as Gardening, and to view their different Ways of Practice, by which he may learn the different Effects of different Soil, and Pruning or Planting, and gather to himself particular Knowledge from Variety of Observation. To finish a Man who has passed thro' these Paths of Study, let him travel first to *Holland*, and from thence thro' *Flanders* to *France*; such a Voyage, tho' it will give him but few valuable Particulars, yet will furnish him with some general Ideas which may tend to his Improvement. He will see in *Holland*, that the Study of Gardening is not unworthy the wisest and greatest Men in the Country; that it is not only used as a Recreation, but as a profitable Business. If he has used his Time well, he will meet with extraordinary Respect, and be encourag'd to proceed in his Studies, and the Pursuit of Knowledge; for no People in the World have a greater Regard for Men of Understanding and Industry than the *Hol-*

landers; their Country is maintain'd by that Policy.

In *Flanders* the Gardens vary from the former, they are more after the *English* Manner, but 'tis the best Passage to *France*, and may prepare the Mind to judge of the *French* Gardens, whose Value chiefly consists in the Management of Fruit-Trees, *Versailles* excepted, which is the Sum of every Thing that has ever been done in the Gardening Way; *Trignon* and *Marly* are partly of the same Taste, and a Sight of them will furnish fine Ideas.





C H A P. I.

Concerning the Gardeners Charter granted by King JAMES I, with Remarks.

To Mr. BRADLEY, Fellow of the Royal Society.

S I R,

I Have had a mind some Time since to print an Abstract of the Charter granted to the Gardeners of *London*; but as I observe in the News, that you invite the Lovers of that Profession to send you such Matter as may be advantageous to Gardeners, I think you may do them Service in publishing it; and if you think proper, you may add the Remarks I have made, but I leave that to your self. The Charter begins thus :

“ JAMES, by the Grace of God, King of
“ *England, Scotland, France, and Ireland,*
“ Defender of the Faith, &c. Whereas divers
“ and sundry Persons inhabiting within the
“ City of *London*, and six Miles Compass there-
“ of, have continually taken upon them to
“ use and practise the Trade, Craft, or Mystery
“ of

“ of Gardening, Planting, Graffing, Setting,
“ Sowing, Cutting, Arbouring, Rocking,
“ Mounting, Covering, Fencing, and Re-
“ moving of Plants, Herbs, Seeds, Fruits,
“ Trees, Stocks, Sets, and of contriving the
“ Conveyances to the same belonging, being
“ therein Ignorant and Unskilful, having not
“ been brought up in the said Trade or Myste-
“ ry; and whereas the said Persons have also
“ daily sold and set unto our loving Subjects,
“ into sundry the Parts of our Dominions and
“ Countries, dead and corrupt Plants, Seeds,
“ Stocks, and Trees, to the great Deceit and
“ Loss of our said Subjects: For Redress and
“ Prevention of which Deceits and Wrongs,
“ we did by our Letters Patents, in the Third
“ Year of our Reign over this our Kingdom,
“ grant to the Gardeners, then inhabiting in
“ *London*, and within six Miles of the said
“ City, that they should be one Body Cor-
“ porate, by the Name of Master, Wardens,
“ Assistants, and Commonalty of the Company
“ of Gardeners of *London*, and did thereby
“ give unto them divers Powers and Privi-
“ leges, as by our said Letters Patents appear-
“ eth: And whereas we are credibly inform’d
“ that there are certain Defects, Questions,
“ and Doubts found and arisen in and upon
“ our said Letters Patents, whereby the Pub-
“ lick Good and Profit of the said Company
“ is much hinder’d, and the Abuses aforesaid
“ still continu’d; which Company of Garden-
“ ers have hereupon made their humble Peti-
“ tion unto us, that we would be graciously
“ pleased to renew the said Letters Patents
“ with Amendment of those Defects, and with
“ such

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“such other necessary Additions and Alterations as we shall think most fit and convenient. Know ye, &c.

It is to be noted, that this Charter was granted at a Time when the Buildings in and near the City of *London*, were not half so many as they are at this Day; there were then many Intervals between the several Houses in *London* and *Westminster*, and other Places, which at present are join'd with the City. Within the Memory of Men now living, *Somerſet-Houſe*, and the Buildings thereabouts, were ſtyled Country-houſes, and the open Places about them were employ'd in Gardens for Profit; and many Parts now within the City and Liberties, were then in the Poſſeſſion of working Gardeners, who were at that Time enough in Number, and employ'd Ground enough to furniſh the Town with Garden Neceſſaries, for then there were few Herbs uſed at the Table with regard to what there are now; but the Succeſs which thoſe regular Gardeners met with at that Time, encourag'd many others to ſet up and profeſs the ſame Calling near *London*, who ſo unſkilfully went to work, that many Abuſes were committed, and the Subject was injur'd by them: The Gentry and Nobility loſt the Certainty and Advantage of their Deſigns, by employing Perſons of no Experience; and therefore it was propoſed, that the *London* Gardeners, who were profeſs'd Men, ſhould become a Body, and inſpect the Worth of others, who pretended to praктиſe without Knowledge, or ſhould offer to invade their Cuſtoms. In the ſame King's Time, I
am

am inform'd, there was an Academy establish'd in *Scotland* for the Improvement of Gardening, which some Persons of that Country tell me is continued and upheld to this Day, which has the Privilege of examining every Person concern'd in that Business, and of allowing or disallowing their Practice, as the Professors find the Persons examin'd are more or less capable of acting as Gardeners ; and moreover it is said, that this Society dictate to the Students in this Art, at fixt Times, such Rules as they are to follow, and reason in Publick with them upon every useful Subject in Gardening : And I wish there were the same Opportunity of improving the young Gardeners with us ; for Conversation promotes Experience, and Experience leads us to Perfection.

But as the Company of Gardeners were establish'd by Charter in *England*, in the Third Year of King *Jam^s* the First, the said Company were afterwards forced to solicit an additional Power, as we may observe they obtain'd in their present Charter ; yet as the Town encreas'd in its Buildings, the Company was invaded by many who call'd themselves Gardeners, and had not the Privilege of their Charter ; for still as the Town encreas'd in Buildings, there was more Profit for those who came to Market, as there must necessarily be more Inhabitants ; and thro' the unskilful Practice of many who brought unhealthful Herbs to *London* at that Time, I am told there was a Proclamation issued out by King *Charles* the First, directing all Magistrates to assist the said Company in the
Exe-

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Execution of the Powers granted them in their Charter, or to that Purpose : It is certain, however, there was then a Proclamation very much in their Favour.

I cannot however leave this Article without remarking two Things ; the first is, that most of the large Mulberry-Trees, which we find in or near *London* and *Westminster*, were planted in King *James* the First's Reign, on account of establishing the Manufacture of Silk ; that Prince having written a Letter to the Lords Lieutenants of the several Shires of *England*, for the encreasing of Mulberry-Trees, and the breeding of Silk-Worms, which it was then thought would add Riches to our Nation ; and was it now set heartily about, it might certainly prove very beneficial to the Publick, and employ a great many Hands which are now idle. The Letter contains an excellent Lesson to the Lovers of their Country, and is as follows.

JAMES Rex.

Right Trusty and Well-beloved, we greet you well.

“ IT is a principal Part of that Christian Care
“ which appertaineth to Sovereignty, to
“ endeavour by all Means possible, as well to
“ beget as to encrease among their People
“ the Knowledge and Practice of all Arts and
“ Trades, whereby they may be both weaned
“ from Idleness, and the Enormities thereof,
“ which are infinite, and exercised in such In-
“ dustries

“dustries and Labours as are accompanied
 “with evident Hopes, not only of preserving
 “People from the Shame and Grief of Pe-
 “nury, but also raising and increasing them
 “in Wealth and Abundance, the Scope which
 “every Free-born Spirit aimeth at, not in re-
 “gard of himself only, and the Ease which a
 “plentiful Estate bringeth to every one in his
 “particular, but also in regard of the Honour
 “to their Native Country, whose Commenda-
 “tions is no way more set forth than in the
 “People’s Activeness and Industry. The Con-
 “sideration whereof having of late occupied
 “our Mind, who always esteem our People’s
 “Good our necessary Contemplations, We
 “have conceiv’d, as well by the Discourse of
 “our own Reason, as by Information gather’d
 “from others, that the making of Silk might
 “as well be effected here as it is in the King-
 “dom of *France*, where the same hath of late
 “Years been put in Practice; for neither is
 “the Climate of this Isle so far distinct or dis-
 “ferent in Condition from that Country, espe-
 “cially from the hither Parts thereof, but that
 “it is to be hoped that those Things which
 “by Industry prosper there, may by like In-
 “dustry used here have like Success; and
 “many private Persons, who for their Plea-
 “sure have bred of those Worms, have found
 “no Experience to the contrary, but that
 “they may be nourish’d and maintain’d here,
 “if Provision were made for planting of Mul-
 “berry-Trees, whose Leaves are the Food of
 “the Worms: And therefore we have thought
 “good hereby to let you understand, that al-
 “tho’ in suffering this Invention to take place,
 “we

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“ we do shew our self somewhat an Adversary
“ to our Profit, which is the Matter of our
“ Customs, for Silk brought from beyond the
“ Seas will receive some Diminution ; never-
“ theless, when there is a Question of so great
“ and publick Utility to come to our King-
“ dom and Subjects in general ; and whereby
“ (besides Multitudes of P^eople of both Sexes
“ and all Ages) such as in regard of Impo-
“ tency are unfit for other Labour, may be
“ set on Work, comforted and relieved, we
“ are content that our private Benefit shall
“ give Way to the Publick. And therefore
“ being persuaded that no well-affected Sub-
“ ject will refuse to put his helping Hand to
“ such a Work as can have no other private
“ End in us, but the Desire of the Welfare
“ of our People ; we have thought good in
“ this Form only to require you (as a Person
“ of greatest Authority in that County, and
“ from whom the Generality may receive No-
“ tice of our Pleasure with more Conveniency
“ than otherwise) to take Occasion, either at
“ the Quarter-Sessions, or at some other pub-
“ lick Place of Meeting, to persuade and re-
“ quire such as are of Ability (without descend-
“ ing to trouble the Poor, for whom we seek
“ to provide) to buy and distribute in that
“ County the Number of Ten Thousand Mul-
“ berry Plants, which shall be deliver’d to
“ them at our City of, &c. at the Rate of
“ Three Farthings the Plant, or at Six Shil-
“ lings the Hundred, containing Five-score
“ Plants. And because the buying of the said
“ Plants at this Rate may at the first seem
“ chargeable to our said Subjects, (whom we
“ would

“ would be loth to burthen) we have taken
“ order, that in *March* or *April* next there
“ shall be deliver’d at the said Place a good
“ Quantity of Mulberry Seeds, there to be
“ sold to such as will buy them ; by means
“ whereof the said Plants will be deliver’d at
“ a smaller Rate than they can be afforded
“ being carried from hence : Having resolv’d
“ also in the mean Time that there shall be
“ publish’d in Print a plain Instruction and Di-
“ rection, both for the Encreasing of the said
“ Mulberry-Trees, the Breeding of the Silk-
“ Worms, and all other Things needful to be
“ understood for the perfecting of a Work e-
“ very way so commendable and profitable,
“ as well to the Planter as to those that shall
“ use the Trade. Having now made known
“ unto you the Motives, as they stand with
“ the Publick Good, wherein every Man is
“ interest’d, because we know how much the
“ Example of our own Deputy-Lieutenant and
“ Justices will further this Cause, if you and
“ other your Neighbours will be content to
“ take some good Quantities hereof to distri-
“ bute upon your own Lands, we are content
“ to acknowledge thus much more in this
“ Direction of ours ; that all Things of this
“ Nature, tending to Plantations, Encrease of
“ Science, and Works of Industry, are Things
“ so naturally pleasing to our own Dispositi-
“ on, as we shall take it for an Argument of
“ extraordinary Affection towards our Person ;
“ besides the Judgment we shall make of the
“ good Dispositions in all those that shall ex-
“ press in any Kind their ready Minds to fur-
“ ther the same ; and shall esteem that in fur-
“ ther

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“thering the same, they seek to further our
“Honour and Contentment, (having seen in
“few Years past, that our Brother the *French*
“King hath, since his coming to the Crown,
“both began and brought to Perfection the
“making of Silks in his Country, where he
“hath won to himself Honour, and to his
“Subjects a marvellous Encrease of Wealth)
“would account it no little Happiness to us,
“if the same Work which we began among
“our People (with no less Zeal to their Good
“than any Prince can have to theirs) might
“in our Time produce the Fruits which there
“it hath done : Wherefore we nothing doubt,
“but ours will be found as tractable and apt
“to further their own Good, now the Way is
“shew’d them by us their Sovereign, as those
“of *France* have been to conform themselves
“to the Direction of their King. Given un-
“der our Signet at our Palace of *Westminster*,
“the Sixteenth of *November*, in the Sixth
“Year of our Reign of *England*, *France*, and
“*Ireland*, and of *Scotland* the Two and For-
“tieth.

This Letter had so good an Effect, that several People began to propagate Silk-worms ; but for want of good Order among them, their Labours came to little. The other Observation is, that before the Buildings in *London* and *Westminster* became contiguous, Roses would blossom in *London* ; but since the burning of *Newcastle* Coal, and the vast Encrease of Building, we find by Experience, in the most open Parts of the Town, they will not thrive enough to blossom.

A a

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The next Thing to be observed in the Gardeners Charter runs thus :

“ That from henceforth all such Person
 “ or Persons as now are Freemen of the
 “ said Company of Gardeners, and all other
 “ Person or Persons to be admitted into
 “ the said Company according to the Pro-
 “ visions in these Presents expressed, and
 “ which are or shall be inhabiting in *London*,
 “ or within Six Miles about the said City
 “ only, and none other, shall be one Body
 “ Corporate and Politick in Deed and in
 “ Name, by the Name of Master, Wardens,
 “ Assistants, and Commonalty of the Company
 “ of Gardeners of *London*, &c. and that by the
 “ same Name they shall have perpetual Suc-
 “ cession, &c.

Then after a formal Set of Words, we find full Power and Authority is given them to have a publick Seal to be alter'd at their Pleasure, and that the Company may purchase Lands, &c. and the *Wednesday* in *Whitsun-Week* every Year, they are to “ Nominate, E-
 “ lect, Chuse and Swear one Master, two
 “ Wardens, and four and twenty Assistants, to
 “ be chosen out of the said Company of Gar-
 “ deners, who shall Order, Rule and Govern
 “ the said Corporation.

It is then said, that

“ It shall and may be lawful to and for the
 “ Master, Wardens and Assistants for the Time
 “ being, or the greater Part of them, to ad-
 “ mit into the said Company such Person or
 “ Persons

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“ Persons as they in their Discretion shall think
“ meet; and they have also a Power to take
“ and keep as their Apprentice or Appren-
“ tices, all and every such Person or Persons
“ as will bind themselves Apprentice or Ap-
“ prentices for the Term of Seven Years and
“ upwards.

N. B. The Place of meeting at present of
the Company of Gardeners is in the *Irish* Cham-
ber, *Guild-Hall*, where such Persons (as I am in-
form'd) who apply to them may be admitted,
provided they are duly qualified to exercise
the Art of Gardening.

“ And further we will, and by these Presents
“ for us, our Heirs and Successors, do straight-
“ ly prohibit and forbid that no Person or
“ Persons whatsoever, inhabiting within the
“ said City of *London*, or the Liberties thereof,
“ or within six Miles compass of the same City,
“ do at any Time hereafter use or exercise the
“ Art or Mystry of Gardening within the said
“ City of *London*, or the Liberties there-
“ of, or without the same within six Miles
“ Compass of the same City, either in Places
“ privileged, or not privileged, whatsoever,
“ without the License and Consent of the Ma-
“ ster, Wardens and Assistants of the said
“ Company for the Time being, or the more
“ Part of them, thereunto first had and obtain-
“ ed, other than such of our Subjects as shall
“ Garden for their own Household and private
“ Spending; and that no Person nor Persons
“ being not admitted of the said Company,
“ and dwelling above the space of six Miles
A a 2 “ from

“ from the said City of *London*, shall from
 “ henceforth sell or put to sale, or offer to put
 “ to sale, any Plants, Herbs, Roots, Seeds,
 “ Trees, Stocks, Slips, Sets, Flowers, or o-
 “ ther things usually sold by Gardeners, with-
 “ in the City of *London*, or within six Miles
 “ of the said City, but only in and at such ac-
 “ customed Times and Places as the Foreign
 “ Baker, and other Foreigners, being not free
 “ of our said City, use to do with their Bread,
 “ or other Victuals; and then also shall depart
 “ the said Places or Markets, with their said
 “ Goods by them to be brought for Sale, &c.
 “ upon pain of Forfeiture of such Plants,
 “ Herbs, Roots, Seeds, Trees, Stocks, Slips,
 “ Sets, Flowers, &c. all which Forfeitures shall
 “ be distributed amongst the Poor of the Place
 “ where such Forfeitures shall be taken.

And after this we find that the Master and Wardens, or any two of them assisted by two of the Assistants, have full Power to make such Seizures, and to search and view all manner of Plants, Stocks, Sets, Seeds, &c. in any Market within their Limits, to see if they are sound, good, wholesome, and merchantable; and if such Goods are deceitful, unwholesome, dry, rotten, &c. they are to seize them, and to burn or consume them, with the Assistance of the Clerk of the Market. And then the Charter sets forth the Company's Power to make Laws, Constitutions, &c. for the good Government of the Master, Wardens, &c. and further commands, that the Lord Mayor within his Liberty, and the Justices of the Peace in the Limits of this Company's Power, shall, upon such Offences as shall be committed against

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gainst the Company, commit such Offenders to the next Goal till they have satisfied the Company in their Demands for the Offence committed.

Thus, Sir, I have given you the most remarkable Passages in the Gardeners Charter, in order to have them publish'd if you think fit, among your Observations in Gardening and Husbandry. I am persuaded you will oblige many of the Gardeners by it, for all of the regular Professors have not every Day the Opportunity of consulting the Powers granted them; and the Practitioners who have at present no Interest in the Charter, may be inform'd of the Company's Power over them, and prevent Losses which else might happen to them by offering such Things to sale as are unwarrantable: And I suppose it may be one Means of keeping the Markets stored with those Herbs and Fruits which are fresh, wholesome and uncorrupt, which some learned Physicians think ought to be as much observ'd as the Goodness of other Meats; for Herbs as well as Flesh, if they are stale and corrupted, contribute to the ill Health of the People.

There is one Thing more which I cannot avoid remarking before I conclude, and that is, the Abuse which is frequently committed in the Markets by the Higlars in Plants, who impose upon the Buyers rotten or decay'd Plants, Trees and Herbs, without any possibility of growing; which is not only a Disappointment to the Purchasers, but likewise an Injury to the Practical Gardeners, who in the Plants bought of them have no room to impose at that Rate There are enough about

London who keep Gardens on purpose for such Supplies as the Town require ; and it is very reasonable to suppose, that the Plants educated in the sulphurous Air partaking of the *London* Smoke will more readily thrive in or about the Town, than those which are brought from distant Places where the Air is clear and thin. All this I submit to you, because you have already in your Writings promoted the Gardeners Welfare in many Instances, and it may be a Means of joining with the present Company of Gardeners a Set of ingenious and able Persons, which may add to its Honour and Reputation.

I am, Sir,

Yours, &c.

L. Musgrove.



CHAP.



C H A P. II.

*Concerning the Improvement of Land by
Timber with extraordinary Observa-
tions relating to the propagating of the
Fir Tree, and its kinds.*

To Mr. BRADLEY.

S I R,

“ I Have been, for many Years, a profess’d
“ Lover of Husbandry, as I think it not
“ only the most innocent, and most health-
“ ful Amusement in the World, but what, if
“ rightly follow’d, may be of great Profit
“ to particular Persons, and of Advantage to
“ the Publick As I design to be a constant
“ Correspondent of yours, I shall not trouble
“ you at this Time with my Opinion of the
“ Authors that have writ upon this Science,
“ nor with the Success or Disappointments I
“ have met with in the Experiments I have
“ try’d: But since I think you design the Good
“ of your Country, you ought not only to
“ meet with all Encouragement, but with all
“ Assistance from the Experience of others;
“ so without further Introduction, I shall make
“ the Fir Tree the Subject of this Letter,
“ which

" which is (for what I can see) very much
 " a Stranger to *England*. I am a *North Bri-*
 " *ton*, and have seen their Way of managing
 " them there, where they not only have great
 " Woods of them, that grow naturally upon
 " Mountains, and (as I am told) are fit for
 " Masts to the largest Ships, but our Gen-
 " tlemen have of late Years made great Plan-
 " tations of them. At first they were fond of
 " them, because of their keeping their Leaves
 " all Winter, and being continually green ;
 " but as they lose much of their Beauty
 " when they pass twenty Years old, especial-
 " ly with the unmerciful pruning that was
 " then in Use, which made them top-heavy,
 " and so yielded to the Wind, even to the
 " breaking them over sometimes; but always
 " the uttermost Rows were crooked. At last
 " Gentlemen came to plant them at a far great-
 " er Distance from their Houses, where their
 " Colour made a fine Show through the whole
 " Year, and the rugged Bark was not so easi-
 " ly seen ; so that now there are, for the most
 " Part, Thickets of other Trees betwixt the
 " House and the Firs. And indeed I would
 " advise a good Thicket of Firs to be plan-
 " ted round any Place where you would wish
 " to have your other Trees thrive well. Con-
 " sider, Sir, that I am speaking of *Scotland*,
 " where our Winds are more frequent and
 " violent than in *England*: So that was any
 " Body to begin a Plantation, I would ad-
 " vise them to plant round the Field a good
 " Number of Firs, even before he sowed a
 " Seed of what we call Grey Timber ; and
 " these ordered (as I hope to shew you) I dare
 " say

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“ say will give such Shelter to the rest, as will
“ much advance their Growth. I shall now
“ begin with the gathering the Lones, Clogs,
“ or Apples, for these are the Names that we
“ have for them: They are fit for pulling in
“ *January* or *February*; if they hang upon the
“ Trees till the Frosts are over, the first Sun-
“ shine opens them, and then the Seed is lost.
“ We are at no Difficulty in getting of them
“ now, because there is scarce a Gentleman’s
“ House where there are not Fir Trees; but
“ some Time ago all the Planters were in a
“ great deal of Hurry to get the Clogs open’d,
“ that so the Seed might be got ready by the
“ End of *March*, or Beginning of *April*; and
“ our Weather not answering some Years, dis-
“ appointed the Planters extremely, so that
“ I have seen the Clogs put under hot-bed
“ Glasses; others laid them at a Distance be-
“ fore a Fire, and had People always by to
“ turn them, and every five Minutes to sift the
“ Clogs with a Wire to get out the Seed.
“ These Ways did pretty well, but were trou-
“ ble some, and the last Way dangerous; o-
“ thers put them in an Oven, or upon a Kiln;
“ but these two last Ways were errant Cheats,
“ since the Seed was overdry’d, so that they
“ proved good for nothing. At last an old
“ Gardener, who long had dealt in Fir Seed,
“ made an Experiment, viz. he gather’d the
“ Clogs at the ordinary Time, laid them up
“ in a cool dry Place, where they got neither
“ Moisture nor the Heat of the Sun, till the
“ End of *July*, or Beginning of *August*; at
“ which Time he laid them out to the Sun,
“ by which Means they opened more in one
“ Day,

“ Day, and a great deal kindlier, than what
 “ could be done in a Month any other Way;
 “ the Seed he carefully kept in a dry cool
 “ Room, and then in the Spring he had the
 “ command of sowing it what Time he pleas’d,
 “ as the Spring was later or forwarder. You
 “ see by this Method it would be no difficult
 “ Matter for the Timber Merchants to bring
 “ the Clogs from *Norway*, tho’ we having the
 “ Tree amongst our selves are not at that
 “ Trouble. The best Way of sowing them,
 “ is in ordinary Ground of Natural Earth, not
 “ forc’d nor poor, the Earth turn’d off with
 “ the Back of the Rakes till the Seed is sown,
 “ which must be done pretty thick; then the
 “ Earth drawn on again, and rak’d very gent-
 “ ly till the Seed is all cover’d: Some Days
 “ afterwards it will not be amiss to sift upon
 “ the Beds some more Mould, free of Stones
 “ or Gravel. Your Correspondent Mr. *Wal-*
 “ *ler’s* Frames are not only a good, but I think
 “ a necessary Way, since the Frames in a few
 “ Years will be much cheaper than hiring Men
 “ to chase away the small Birds (especially
 “ the Gold-finch) from the Beds, who are so
 “ greedy of the Seed, that if it is not guard-
 “ ed, your Nursery will soon be pick’d up.
 “ Before Winter comes on, it is absolutely fit
 “ to throw some Saw Dust, Chaff, or some-
 “ thing of that kind upon your young Plants,
 “ to preserve them from the Frost, which o-
 “ therwise would swell the Ground, and so
 “ spew them up. In *Scotland* they used Coal
 “ Ashes, which I thought too hot, and rather
 “ chose the other Way. If the Seed has been
 “ good, and sown thick enough, there will be
 “ no

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“ no occasion to weed the Beds the next Year;
“ if it has not, they must be weeded, but very
“ carefully, lest the young Plants be pulled
“ up. When they have been two Years in the
“ Ground, from the Sowing; for Example,
“ from the End of *March*, 1721, to the End
“ of *March* 1723, they must be remov’d. In
“ our Country it was the Custom to put them
“ in Nursery Ground, at about a Foot’s Di-
“ stance, where they were to be kept clean
“ from Grass, Weeds, &c. for two Years more,
“ and some have kept them a great deal long-
“ er, though I think with very little Success,
“ which was both troublesome and expensive.
“ But some Gentlemen made Tryals of remov-
“ ing them from the Seed Bed to the Place
“ where they design’d they should always stand.
“ Their Method was this: Having got the
“ Pits ready, with the Earth fill’d in, they drew
“ as many young Firs as they thought they
“ would be able to plant in a Day; the Roots
“ of these they dip in a Tub of Earth and
“ Water mix’d together till it be pretty thick,
“ and lay a Handful of this Pap upon the
“ Roots, to keep the Air from drying them;
“ one Man can carry a great many in a Bas-
“ ket: When they come to the Pits, they plant
“ them with a Dibble. They found by this
“ Practice, that fewer Firs misgave than when
“ they were put in Nursery; and you may
“ judge what Trouble and Expence was sav-
“ ed. At the same Time, I must tell you,
“ that now very few Firs are planted with
“ us, except it is in heathy, poor, sandy, gra-
“ velly, or rocky Ground, where nothing else
“ is likely to grow; if they are planted in
“ richer

“ richer Soil, either for their Beauty, or to be
 “ a shelter to other Trees, they must be weed-
 “ ed: But as I am resolv’d to treat in another
 “ Letter, of the Benefit they may be to other
 “ Plantings, I shall say nothing of that here,
 “ but proceed to give you an Account how we
 “ use them in our poor Grounds, where Weed-
 “ ing is altogether needless; and by the by, I
 “ must acquaint you, that a Fir will, in a poor
 “ hungry Soil, grow as fast, and I believe bet-
 “ ter Wood, than in a richer Mould. The
 “ Way I would chuse to plant them is at four
 “ Feet’s distance, without attempting any Re-
 “ gularity, since I think them only fit for
 “ Thickets, and not for Walks. I do not be-
 “ lieve that they will ever come to be great
 “ Trees, if they are allowed to stand thus
 “ thick; but this I know, that when they are
 “ planted close, they help each other to grow.
 “ When they grow troublesome by their Near-
 “ ness, it is easy to prune Branches from some
 “ of them, which will give Air, by degrees,
 “ to the rest; and doing this yearly, you may
 “ cut down some of them as you see Occasion:
 “ But I would not chuse to prune a Fir that I
 “ design’d for Timber, since our best and only
 “ Fir Timber comes from Countries, where
 “ I dare say they never were touch’d with Iron,
 “ till they were felled. And I reckon, the Rea-
 “ son that makes the Timber that Gentlemen
 “ cut down so full of Knots, is the Pruning;
 “ for if Firs are let grow close together, the
 “ great Boughs in Time grow smaller by want
 “ of Air or Nourishment: So that I have re-
 “ mark’d a low Bough as big as my Leg wi-
 “ ther till it grew as small as my Finger, and
 “ then

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“ then drop off ; so that I believe, by this
“ Means the great Knots will not be found
“ in these Trees, when they are cut down. I
“ have now in a superficial Way given you my
“ Opinion as to the Method of propagating
“ this Tree, which I am sorry to see so little
“ Regard had to in this Country, considering
“ it is so easy to be had, and there is no
“ Ground so barren in which they will not
“ thrive ; they are green all the Year, and how
“ much Demand there is for that Timber from
“ Abroad is pretty well known. So that I have
“ been surpriz’d to see such wild Wastes where
“ these Trees, (if they had not been despis’d)
“ might have now made a fine Figure, and
“ been of great Profit to the Country. But
“ since you are upon a Design to shew your
“ Fellow-Subjects the Way of being innocent-
“ ly rich, without dangerous Schemes, I
“ thought it my Duty, as a *Briton*, to tell you
“ what I know ; and though this Account
“ may be very imperfect, yet I hope after-
“ wards to make it up, by adding any thing
“ I may have forgot, or any new Experiment.
“ If my Brother Planters find Fault with what
“ I have said, I shall either own my Mistake,
“ or give my Reasons for my Assertions. I
“ hope none of your Correspondents will take
“ it amiss, if in the Course of my Letters to
“ you, I differ from them in some Things ;
“ but I shall not insist upon any thing of this
“ kind now, having, I’m afraid, been too te-
“ dious already. I shun’d using any hard
“ Words, because I think, in such a Business,
“ the plainer a Man is, the better ; and it is
“ rather to Gardeners than Philosophers, that
“ the

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“ the drudging Parts of Planting belong. I
 “ hope no Body will find Fault with me for
 “ recommending a different Method than any
 “ I have yet met with in Authors upon this
 “ Head: But this I am sure of, that I have
 “ seen the Way I have set down follow’d with
 “ great Success. As to the new Way of Plant-
 “ ing large Trees, and even Firs in the middle
 “ of Summer, I have seen it at a Gentle-
 “ man’s whom you will always have Occa-
 “ sion to mention with Esteem; tho’ I think
 “ it is fittest to be practis’d where one is in
 “ haste to have a Garden, or a sudden Planta-
 “ tion: But what I have been writing about
 “ is for much larger Designs, and of a Tree
 “ that will not in many Years be worth the
 “ Money and Labour that it will cost in
 “ the transplanting if big: For in great Pro-
 “ jects, where Profit as well as Pleasure is
 “ aim’d at, the saving of Money is to be re-
 “ garded; and I can see no way of doing
 “ this but by planting young Trees. And in-
 “ deed, I am not sure but a Fir Tree of two
 “ Years old, planted as I have told you, may
 “ in Forty Years be of as great Stature and
 “ Value, as one transplanted of Fifteen at
 “ the End of that Time. I hope I shall have
 “ Occasion after this, to write upon several
 “ other Heads, and wish your Correspondents
 “ may encrease. For my part, I shall advance
 “ nothing but Matters of Fact, since I think
 “ no Man of Honour would impose upon one
 “ that wishes so well to his Country, as I dare
 “ say you do.

I am, Sir,
 Your most humble Servant,
 John Edenbrugh.

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This Letter gives us an ingenious Account of the Method of Planting the Fir, which is a Tree that has hitherto been little understood in the South Parts of *Britain*; and I hope it will be a Means of propagating that useful Plant among us, and of employing some of those Lands, which, till lately, have been accounted the most unprofitable. But as a farther Correspondence with the curious Author, may give us Opportunities of reaping still more Advantage from it than he has mentioned in this Letter, I shall be glad of an early Supply from him for my Readers Benefit.





Some material Points in the Improvement of barren Lands, by planting of Firs, and of the pruning of Trees.

- *Richard Bradley,*

“ **B**eing a constant Peruser of thy Monthly
 “ Books, I perceive by these, and thy
 “ other learned Works, as well as by Experience, that the true Knowledge of pruning
 “ of Trees, is the greatest Art requisite to
 “ make a compleat Gardener. I am Master
 “ of a small Plantation of Fruit-Trees, situated in a good Soil, expos’d to the South,
 “ fenc’d by a Hill and an old Castle from
 “ the North and East; but notwithstanding
 “ these Blessings of Nature, I cannot have
 “ any Quantity of Fruit, tho’ my Trees never want to have a great Quantity of Blossoms. This I impute to my Trees being
 “ too luxuriant, and running too much into
 “ Wood. I have cut off a great many Branches; I have brought them to fine Heads;
 “ I have scarce left any Branches but what
 “ grow Horizontally.

“ But I find by Experience, that my Labour in a great Measure is lost.

“ I went last Month to see *John Warner’s*,
 “ of *Rotterbitb*, little Vineyard, which thou
 “ speakest

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“ speakest of in one of thy Books : I find it
“ to be above what thou say’st of it. The
“ Wine for its Flavour and Strength is to
“ be admir’d ; but his Vines, I must tell thee,
“ are of a different Sort from those thou re-
“ commendest in thy Book to be planted in
“ *England*, and are manag’d after another Man-
“ ner from what is recommended in thy Book,
“ as practis’d by thy Friend the ingenious *Tho-*
“ *mas Fairchild*, and thy other Friends.

“ But now, to return to the pruning of
“ Trees : I find that *John Warner* has alto-
“ ther Way of doing it, from what is recom-
“ mended in thy Books, or practis’d by any
“ Person else that I could hear of before, and
“ ever since never fail’d of Plenty of Fruit.
“ His Way of pruning his Trees is so easy,
“ so ornamental, and so consistent with good
“ Sense, according to my mean Capacity,
“ that I was soon induced to believe what he
“ told me.

“ Thou hast seen his Garden ; he has two
“ long Canals planted on each Side with Dwarf
“ Trees ; his Soil is very good, his Trees
“ very luxuriant ; he never could bring them
“ to bear Fruit by the ordinary way of Pru-
“ ning ; but since he has made Use of this
“ new Method of Pruning, he told me he ne-
“ ver miss’d of having every Year great Plen-
“ ty of Fruit. *John Warner’s* Method is this :
“ He lets two, three, or four of the straitest
“ and largest Branches grow up a Yard or
“ two higher than the Tree ; these closely he
“ prunes all over. I imagine that these May-
“ pole like Branches (for they resemble May-
“ poles) carry off the Super-abundance of the

B b

“ Sap,

“ Sap, that formerly hinder’d the Trees from
 “ bearing, which could not be done by the
 “ common Way of Pruning. He tells me,
 “ that by this Way he never fails of having
 “ Plenty of Fruit : Experience is the best Ma-
 “ ster, and cannot be contradicted.

“ My Friend, thou art very knowing in the
 “ Secrets of Nature of these Kinds ; I should
 “ be glad to have thy Opinion in this Matter,
 “ if thou approvest of it as beneficial to the
 “ Publick, recommend it to thy Friends ; in
 “ that thou wilt oblige very much

Thy unknown Friend,

R. W.

P. S. “ In thy Books thou recommendest
 “ very much to the Publick the Planting of
 “ Fir-Trees, and hast printed a Letter from
 “ a Friend in *Scotland* on that Subject. But
 “ I wonder very much, that thou hast never
 “ heard of the finest Plantation in the World,
 “ for its bigness, near *Hope*, six Miles beyond
 “ *Gloucester*, in the Road to *Monmouth*. It
 “ was planted by one *Wade* of *Gloucester*, on a
 “ high barren Common, which bears nothing
 “ but Furze and Fern. The Trees thrive ve-
 “ ry well ; they are planted in a regular Man-
 “ ner at a great Distance ; they make the
 “ finest Prospect that ever I saw in any Place
 “ of this Nature, and I am no Stranger to o-
 “ ther Countries. It is so ornamental, so beau-
 “ tiful, and so commendable a Sight, that it
 “ cannot be admir’d too much : The only
 “ Fault

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“ Fault to be found in it, is, that the Trees
“ are plantēd at too great a Distance from
“ each other ; then instead of some Thousands
“ that grow there now, there might be some
“ Hundred Thousands. It is an Observation,
“ that Trees will not thrive upon high cold
“ Hills, except they are plantēd close toge-
“ ther, and in Quantities. The large Planta-
“ tions made by the Duke of *Beaufort*, on
“ the Hills near *Badminton*, has convincēd the
“ World of the Necessity of plantēd close and
“ in Quantities on such cold Hills. There
“ was a great deal of Labour and Money lost
“ on those Plantations. An honest Friend told
“ the Duke, that he had taken Care and pro-
“ vided well for the Body of his Trees, by
“ making Walls about them, but that he had
“ not bestow’d upon them Night-caps to co-
“ ver them from cold Weather, for want of
“ which they never thriv’d. It is worth thy
“ while to enquire about this Plantation of
“ Firs. *Adieu.*

The foregoing Letter contains many Mat-
ters of Consequence, which I may hereafter
explain more fully. I shall at present only give
some general Hints concerning the Manage-
ment of such Trees as blossom freely, and bear
little Fruit, and defer the entering into Par-
ticulars upon this Subject till another Oppor-
tunity.

In that Part of this Work which relates to
Fruit I have taken Notice of the May-pole
Branches here mention’d, under the Title of
Waft-pipes to carry off the over-abundant

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Sap; these I have only observ'd at Mr. *Warner's* at *Rotberbith*, and am perswaded they are of extraordinary Use for bringing a Tree to bear.

2. I do not think that leaving only the horizontal Shoots of a Tree, can any way put a stop to the Luxuriance of it; but the bending or laying down of upright Branches horizontally, checks the Sap, by stopping its Course thro' many of the Vessels, and helps the pithy Parts to digest their Juices so as to produce Flower Buds; for all Buds of a Tree are either Leaf Buds, or Flower Buds, as the Pith is more watry or undigested, or more dry and tending to decline.

The Pith in one Year's Shoot is abundant and watry.

The Pith in a Shoot of two Years is less in quantity, and more dry.

The Pith in a three Year's Shoot is hardly to be discern'd; and in older Branches is of no Use, and entirely consum'd or rotted.

Now, where this Pith is overcharg'd with Water, we seldom observe any Disposition to flower; or if the Tree blossom, the *Farina* which should impregnate those Blossoms, is so unripe that they very rarely set for Fruit.

3. There are some Soils which encourage Trees to shoot large luxuriant Roots, which imbibe so much Water, that the Shoots which answer them in the Head of the Tree, are overcharg'd with Sap; and in such Case either those Roots should be pruned, or some waste Branches or Pipes should be left growing to discharge those watry Parts, as in Mr. *Warner's* Trees.

Trees. But I wish to know what Soil, and how Deep, is in the Garden of my Correspondent R. W.

4. It may happen that the Blossoms may be destroy'd by Dale Mists, or Frosts.



*To Mr. R. W. A Letter concerning
Fruit-Trees dropping their Blossoms:
With some Thoughts how it may be
prevented.*

S I R,

“YOUR Love for Gardening is so ex-
“preffive in your Letter to me, that
“I am fond of an Opportunity of lending you
“what Assistance I can towards putting your
“Trees in a Method of rewarding your La-
“bours with good Fruit. The Hints which
“I have given on this Occasion in my Papers
“relating to Fruit, are what, I think, may
“contribute something towards their Help ;
“but I shall now open the Case a little more
“plainly than I did before, from Experiments
“that I have made.

“I have observ'd that Trees which have
“been much prun'd are subject to shoot un-
“equally, that is, some Parts will shoot more
“vigorously than the others ; or in some Ca-
“ses all the luxuriant Branches will be on one

“ side, while the Bearers lie in a little Com-
 “ pass on the other side of the Tree. Now
 “ where it happens that the vigorous Shoots
 “ are very prevailing over the bearing Branch-
 “ es, the blooming Branches commonly drop
 “ their Blossoms, either before they set for
 “ Fruit, or else drop the Fruit that does set
 “ upon them about *July*, which is the Time
 “ of a Tree’s second shooting; and this for
 “ the same Reason that the weaker Branches
 “ of a Tree are made to blossom; for the
 “ luxuriant Branches, when they happen to
 “ get the better of the smaller, imbibe all
 “ they can of the Juices of the Tree, and rob
 “ the smaller Shoots of that Sap which should
 “ have supported their Strength; and Expe-
 “ rience teaches us, that by weakening any
 “ Vegetable of the greatest Vigour, we bring
 “ it to bear Fruit.

“ *Mr. Fairchild* observes very well, that
 “ when by this means one Part of the Tree
 “ is brought to put out Blossom Buds, if the
 “ other Part remains to shoot vigorously, those
 “ vigorous Shoots will draw so much of the
 “ Sap to themselves, that there is not enough
 “ left circulating in the bearing Part to sup-
 “ port the Blossoms, and therefore they drop;
 “ or else should they not be so much impo-
 “ verish’d at the blossoming Time as to drop
 “ them; yet when the Tree comes to make
 “ its second Effort in *July*, the bearing Branch-
 “ es might then be so slenderly nourish’d as
 “ to occasion the falling of the Fruit that was
 “ set in the Spring.

“ Now in such a Case there are many who
 “ would prune the luxuriant Branches within
 “ three

“ three or four Buds, to prevent this Mis-
“ chief; but such Pruning as that provokes
“ the pruned Part to shoot still more vigor-
“ ously, and there is still greater Expence of
“ Sap than there was before; and then the
“ bearing Part becomes still a greater Suffer-
“ er, and often dies. When Plants are thus,
“ through ill Management at first, brought
“ to such an unequal Method of shooting, I
“ would either prune very little of the vigor-
“ ous Shoots, or bend them down to check
“ their Luxuriance without pruning at all: And
“ then I judge that the Circulation of Sap in
“ the Tree would become more regular; by
“ the checking the strong Branches the weak
“ ones would have a greater Share of Nourish-
“ ment, and even the strong Branches would
“ be brought into a bearing State: But this
“ is only with regard to Dwarf Trees, or
“ Walls, or Espaliers, where the little room
“ we have must be employ'd to the best Ad-
“ vantage; when this is our Case, I think we
“ should not so much study the great Regu-
“ larity or Figure of our Trees, as how they
“ may bring Fruit in abundance, and some-
“ times their Look will be rude enough.

“ A Standard Tree, if it likes the Earth,
“ has in it self a natural Regularity without
“ pruning; and we observe, that the great
“ Branches, if we allow them Time, will bear
“ well, especially if we cut some of the great
“ Roots after *Midsummer*, for those great Roots
“ are the Cause of the Over-vigour of the
“ Shoots: So that if Pruning is necessary, I
“ think it should be rather in the Roots than
“ upon the Branches, for the Earth will sooner

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“ heal a Wound than the Air, and when the
 “ Cause is remov’d, the Effect ceases. The
 “ Sum of what I have observ’d in the com-
 “ mon Way of Pruning amounts to this, that
 “ in much Pruning there is much Mischief.

“ Mr. *Heron’s* Letter to me, inserted in this
 “ Work, may yet help you ; for whether it
 “ be from Pruning or Frosts, that your Blos-
 “ soms do not hold upon the Trees, the Prac-
 “ tice of his Method will sufficiently arm a-
 “ gainst both.

I am, Sir,

Yours, &c.

R. Bradley.



C H A P.



C H A P. III.

Concerning the Facility of raising Timber Trees, in a Letter from Sir Henry Goodrick, wherein it appears that weeding of Timber Plantations is unnecessary.

To Mr. BRADLEY.

S I R,

I Having lived in and about *London* at the Age when Youth usually chuse their Pleasures, and those of that Place being very different from what are called Country Sports, I became not at all inclinable to join in the Diversions of my Neighbours, when I came to live in the Country, as having no Taste of their Pleasures; so fell into those of Planting and Gardening, which seemed most suitable to my always desired Retirement in the Country, where I have been settled about Ten Years: And to assist me in the Prosecution of my Planting, there has (I believe) no Book come out relating to the Subjects of Gardening, Planting, or Husbandry, that I have not procured; and, amongst the rest, one lately publish'd

lish'd by your self, (intitled, *New Improvements of Planting and Gardening, both Philosophical and Praetical*) in the Conclusion of which you encourage all your Readers to communicate any Observations they have made, which must be my Excuse for giving you the Trouble of this Letter. If what I have observed be acceptable to you, or the least useful to my Brother Planters or the Publick, I have my End; if 'tis not, or they chance to be Observations made by others more experienced, then you have, Sir, only the Trouble of reading this, for which I ask Pardon, as also for acquainting you with one Mistake some way slipped into your Book, in the sixty fifth Page and sixth Line, where you say that Acorns and Ashen-Keys, will come up the first Year: Acorns indeed always do, if they come up at all; but then Ashen-keys are as sure to lie two Winters and one whole Summer in the Ground, as any Seed whatever.

As to my Observations of what I think may be useful, I find the Expence of Planting one great Discouragement to it, and the weeding of young Plants (seedling Oaks especially) to occasion the greatest Part of the Expence; and I found by Experience, that if the Plantation exceeded the Extent of a Grove, the Trouble of weeding was endless, and the Charge discouraging; and yet all Treatises about Planting, made that Weeding to be absolutely necessary. However, I resolved between Three and Four Years ago, to try an Experiment, and sowed several Acres of Ground with Acorns, keeping it fenced. I took no farther notice of it, but
let

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let the Weeds grow and fall as Nature guided them, and now have ordered about a Yard or Two square of that Ground to be cleared of Weeds and Grass, and find my young Oaks there thriving and healthy under the tall Weeds, and likely to become a Wood in a few Years, and doubt not but when they raise their Heads above the Weeds, they'll soon shoot away prodigiously; for though they might have grown something faster, if weeded, yet the Roots may have been strengthening themselves under-ground all the while, and Weeds and Grass may have sheltered them from many external Injuries such small Plants are subject to, as Frosts, Droughts, the Cropping of Hares, &c. and the rotting of the Weeds yearly upon the Ground, must enrich the Land against the increasing Bulk of the Trees requires more Nourishment; whereas, the carrying off of those Weeds must certainly impoverish the Soil, tho' the present weeding and stirring the Soil may force the nutritious Juices into the young Plants, and thereby give them a more speedy Increment now; but hereafter when they will require more Nourishment, they are not only deprived of what they formerly had, but the Soil being impoverished by the continual carrying off of what it produced annually, the Trees remaining may grow mossy, stunted and hungered, and consequently never make good Timber. If this Method of Sowing, without farther Charge than only that of fencing, be approved, then his Majesty's Forrests (now Desarts) may be replenished with Wood at much less Expence than I think has been proposed hitherto;

therto; and 'twill be great Encouragement to all large Plantations, which the Charge of Weeding has hitherto confined in a narrow Compass. I must indeed own, that all small Trees transplanted must be weeded, or they'll be choaked by those Weeds, which Nature makes a Shelter to the Seedlings; therefore Plantations of that kind of Elm that does not bear Seed, and all Trees raised of Sets transplanted, must be weeded.

Another Observation I must mention, that where any Falls of Timber have been made, and according to the Direction of our Planting Books (nay, even of our Laws) several young Trees have been left standing, that they have soon after been starved with the unusual Access of the cold Winds, and come to nothing; whereas, where the Fall has been general, the young Trees so cut amongst their Seniors, have from their Roots made strong Shoots, from their first Advance out of the Earth accustomed to the Cold, and continuing their Growth with the Shelter of what sprang from the Roots of some older Trees, have come (as I am informed by experienced Men) to grow up to good Timber. This also appears plainly in all Plantations, that where the Trees are set or sown at the distance they are designed to be at when come to Perfection; that such Trees spread their Branches, grow crooked, and never grow to tall or strait Timber; and that where they are thick planted, there is an Emulation as it were among them, which should outstrip each other; and when some have got the start, they soon take the Nourishment from their less thriving Neighbours,

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Neighbours, which less thriving are the properest to be removed, (before they grow quite stunted) to some new Plantation, and being cut down like Quickset will go near to thrive well.

I should also recommend the Sowing of all Maist when Nature directs, (especially Acorns in *October*) viz. as soon as they are ripe, for those I sowed in that Season did very well; and those for the most part failed which I reserved till *February*, the Month directed for sowing them; the Reasons I suppose to be as follows, that *October* is a Month for sowing Hard-corn or Winter-corn, and then the Mice, Rooks, &c. are busy in storing themselves with Corn either yet left scattered or new sown, and will not be so greedy after the Acorns; and the Acorns reserved till *February* will spire by that time do what you can, so must be sown, and that Month being too early for the Spring Seed-time of Corn, the Rooks and Mice, &c. especially the Rooks, are so pinched for want of other Food, that they will dig over all the Ground new sown with the Acorns, and destroy great part of them, and meddle not with those sown in *October*, the new breaking of the Ground being the natural Direction for them where to seek their Food.

I own, Sir, I expect with Impatience your promised Treatise of the *Parterre* and *Flower-garden*, since so ingenious and curious a Pen must make that Subject diverting and useful, who have in this former Treatise handled the new Philosophical Doctrine of the Generation of Plants with so much Argument, that 'tis
convincing,

convincing, though at first Sight. I confess my self not skilled in Flowers, leaving their Culture (tho' I love them) to my Gardener, whilst I employ my self in my Park and more distant Plantations: But if I am blessed with Continuance of Life so long as to see my long-lived Plants in some tolerable Perfection, I may then chance to amuse my self in my *Parterre*, where I may meet with Pleasures less fatiguing to the Infirmities, which Advance of Years brings on us all. I once more ask Pardon for this Trouble; but be assured, that as 'tis the first Letter I have written to a Stranger on this Subject, so I would not have writ it now, had I not relied upon the Candour of an Author, whose good Sense and Speculation will make Improvements from the Hints of those who have but slight Experience, and amongst such, Sir, of your unknown humble Servant,

H. GOODRICKE.

*Ribstan near Borough-bridge
in Yorkshire, January 29.
1716-17.*

P. S. I have made, and am still making, several little Experiments in Planting, Gardening and Husbandry, which I forbear to mention, believing the Curiosity of others more experienced may have led them to make the same, though they have not come to my Knowledge at this distance from *London*, where the Curious all communicate.

—IN

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IN Answer to the Ingenious Author of this Letter, I have already hinted in my *Kalendar*, at the Reason that induced me to suppose the Ashen Keys came up the first Year, *i. e.* that those Seeds which are two Years old of Ash, will frequently, if not always, do it: But I am sensible that the Ashen Keys fresh ripen'd will lie two Years in the Ground, as Sir *Henry Goodricke* affirms.

To follow the Dictates of Nature, in the putting of some Seeds into the Ground, is certainly the reasonable way, and undoubtedly may be a Means of preserving them from the Rooks or other voracious Birds. But his Grace the late Duke of *Rutland*, to whom I read this Letter, told me, that the Seminaries which he made in Autumn, had suffer'd extremely by the Mice, Squirrels, and such like Vermin; so that he imagin'd he had lost above half the Seed that was sown; so that 'tis almost unavoidable but some must be destroyed. But I think the surest way of preserving those which lie two Years in the Ground, would be to sow them with some Corn or Grain, which will pay more than the Expence of the Seminary five times over; and the Corn is of so different a Make and Structure in its Parts from the Trees we sow with it, that it does not any way rob the Ground of the Nourishment which such Trees will require: And I am fully perswaded, as well from what the aforesaid worthy Gentleman relates concerning his Nursery of Oaks, as from the Experience I have had since I received his curious Letter, that Grass and Weeds rather contribute to the Preservation of young Seedling
Trees,

Trees, than do them any Harm; and therefore, as he justly observes; that Expence of weeding is unnecessary, especially among those Trees which are tap-rooted, as Oaks, &c. The Postscript of the Letter gives me hopes that the Gentleman who wrote it will yet be so kind to the Publick, as to continue his ingenious Experiments, and give the World an Opportunity of improving by them.

But let us now enter upon a few Remarks and Experiments relating to the Improvement of some Soils and Grains, as they have been practis'd by several ingenious and learned Men.

Dr. *Bury of Compton in Devonshire* tells us in a Letter, that the burning of the Surface, which is so much practis'd in his Country, is only used in bad Lands, and by worse Husbands; for it robs the Ground, which he tells us, is not only an Observation of his, but also of his Grace the Archbishop of *Dublin*. If by bad Lands these Great Men understand the Moory or Heath Grounds, I cannot see what well can be done with the Turf or Peat (which is the Heathy Turf) unless it be burnt upon the Ground: For though this is used for Firing by some poor People, yet when there is any large Quantity of such Land turn'd up, there will be more Turf or Peat than can well be carry'd away. And again, as this Turf chiefly consists of Roots and other parts of Vegetables, there must be in it many vegetable Salts, which after 'tis burnt, will be fixt; tho' indeed we may say they are only the Salts of such Herbs and Plants as we seek to destroy,
and

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and are not proper for the Crop or Grain they ought to nourish. But as we have observed before, that by Solution, and exposing to the Air, these Alkaline Salts will yield the Marine Salt; so the letting these Ashes lie for a while exposed to the Rain, Snow and Air, as Experience shews, will bring them to that State, which Dr. *Bury* in his Letter esteems to be proper for the Improvement of decay'd or infertile Land.

The Doctor tells us, Salt quickens dead Land, and is used in the South-west part of *Devonshire*, which would else be the barrenest, but is now the richest Part of it: The People in that Part of the Country get Sand as far as the Sea will permit at the lowest Ebb, and do not grudge to carry it upon Horses Backs fourteen Miles to spread on their Land, and thereby improve it both for Corn and Grass; in other Parts of the same Country they mend their barren Land with Lime:

He adds, that some suppose that crude and single Salt, if strew'd on the Ground, does not improve, but corrode it, and Lime betters it; but in this they agree, that they produce not Grass fit for the Scythe, but for Pasture, short and sweet, and growing all the Winter, nor are their highest Grounds parched in the hottest Summer. This is matter of Fact, and known to every Ploughman. It is farther related, that by the coupling of these Male and Female Salts, the Country would be much improv'd; if the Sea Salt is too lusty and active of it self, the Lime has a more balsamick and gentle Salt, which being directly join'd with the other, is thereby invigorated.

C c

Glauber.

Glauber gives us a Lesson upon this Occasion, not unworthy our notice: Take, says he, Quick-lime, and let it slack by time without Water; then take Salt and Water, mix them together, and make them into Balls, dry them as you do Bricks, and burn them two Hours; he tells us this Compost will enrich your poorest Land.

Doctor *Bury* is so far persuaded of the good Effect of Salt and Lime, that in the Conclusion of his Letter, he wishes the Duty were taken from Sea Salt, that it might be more generally used for the Improvement of Land. And truly, I cannot help joyn'g with him in his Thought; for as he observes, Grass Grounds are much improv'd by common Salt; and such things as abound with Marine Salts, are greatly helpful to those Lands which are design'd for any of the Gramineous or Grassy Tribe. 'Tis a common Practice in many Places near the Sea, to manure their Grounds for Corn with Sea Weeds, but they must be plough'd in pretty deep, and as soon (if possible) as they are brought upon the Land; nor is the Brine or Lye for the Grain less to be regarded by some People than the Manures for the Land 'tis to be sown in, therefore I shall give the following Examples.

Mr. *De la Prime* has given us an Account of some Experiments relating to the steeping of Pease, Wheat, Barley, and Oats, which are recorded in the *Philosophical Transactions*, and may serve to lead the Curious how to judge of Brines for steeping of Seeds

On the twenty second of *March* he steep't
A Pea, Barly, and Wheat in Brimstone Water.
The

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The same kind in Allom Water.

Ditto, in old Dissol. of Sal. Tartar.

Ditto, in Cap. Mort of Sal. Arm. dissolved in Urine.

Ditto, in the Dissol. of Salt of Walls.

The same in the Dissol. of Nitre.

Ditto, in Urine.

After steeping them five Days and a Night, he set them in a good Garden Soil, against a Wall full exposed to the Sun, on the twenty seventh of the same Month, after a rainy Night, with a Pea, Wheat, Barly and Oat unsteep't.

On the tenth of *April*, the Pea, Barly, and Wheat steep'd in Brimstone Water were all up together

The Pea in Allom Water swell'd, but not sprouted, but the others steep'd in the same above Ground.

The Pea in Solut. of Sal. Tart. half come up, the Wheat scarce sprouted, but the Barly and Oat quite up.

The Grains steep'd in Cap. Mort. of Sal. Armoniac dissolved in Urine were all up together, as also the others that were steep'd in Solution of Salt of Walls.

The Pea and Wheat in the Dissolution of Nitre were about half up, the Barly and Oat quite up.

The Barly and Oat steep'd in Urine were come up, but the Pea and Wheat scarce sprouted.

From whence this Gentleman observes, that Allom Water is not agreeable to the Nature of Pease, and retards their Growth, because the Pea unsteep'd was up as soon as any of the

other Grains; and the Salt of Tartar is not friendly to Pease or Wheat, but is concordant to the Nature of Oats and Barly.

He farther observes, that the Wheat, Barly and Oat not unsteep'd were up as soon as any of the rest; so that he concludes such Brines as he used, rather retarded some of the Grains steep'd in them, in point of Quickness of Growth, than brought them forward: But then he remarks, that three Spires of the Barly, which he left to grow at a Foot and half or two Foot distance, increased so exceedingly, that one had sixty, another sixty five, and the other sixty seven Stalks apiece from their single Grain or Root, with every one an Ear on, and about forty or more Grains apiece in them.

Digby mentions a Plant of Barly, that by steeping first the Grain in Salt-peter dissolved in Water, and keeping the Plant watered with the same kind of mixture, brought forth two hundred forty nine Stalks, and above eighteen thousand Grains; and *Cambden* mentions, that the Corn sown in a Field in *Cornwall* after a great Battel, brought forth four or five Ears on every Stalk, if he was not imposed upon. I am apt to suppose that the Richness of the Ground he speaks of, proceeded from the human Blood that was spilt in the Battel, for it is certain all animal Bodies and their Appurtenances are great Helps to Vegetation, as I have explained in some of my former Works.



C H A P. IV.

An expeditious Way of raising a Coppice or close Wilderneck, with the Method of embellishing it with Wild Flowers; as also some Hints for rendering it still more Rural, by raising of tame Pheasants and Partridges: In a Letter to Mr. R. S. of Surry. To which is added, the Method of improving Land by Alders and Abele's.

S I R,

I Had the Pleasure of your Commands relating to a Coppice or close Wilderneck, dated June 16. I find every one agrees with you, that to find an Invention for making such a Plantation compleatly at once, would save Time, and that it would be, in some sort, adding to the Length of our Days.

"I have been diligent to observe the Plantations made in several Nurseries, and have as industriously enquir'd the Time of planting of every Parcel of Trees growing in them, that I might at least let you know

C c 3

"how

“ how long you must wait for the Perfection
 “ of the Plantation you design.

“ By the Perfection of such a Plantation, I
 “ mean, that it be planted compleatly, and
 “ that every Plant be in that vigorous way of
 “ Growth, that we may look upon it rather as
 “ a natural than an artificial Work. I have
 “ seen a Plantation of this Nature, which has
 “ been only four Months planted, that has
 “ grown above four Foot high; and the se-
 “ cond Year some of the Plants have been a-
 “ bove eight Foot, which is high enough to
 “ give a pleasing Prospect. This I observ’d
 “ at Mr. Scot’s, a very curious Nursery-Man
 “ near *Chelsea* College.

“ The Accident which produced the tall
 “ and upright Shooting of these Plants, gives
 “ me Opportunity of prescribing for your De-
 “ sign the same Method of Planting as was
 “ practis’d at Mr. Scot’s: He transplanted a
 “ large Parcel of young Elm Plants out of
 “ the first Bed in *March* 1720, setting them
 “ in Rows about six Inches distant from one
 “ another, and the Lines about a Foot apart;
 “ by which Means they were not subject to
 “ make too many collateral Shoots, but were
 “ all inclined to rise and meet the Air above;
 “ so that these upright Shoots had not only
 “ their own natural Share of Nourishment, but
 “ likewise enjoy’d all that should have gone
 “ to the Furniture of the collateral Branches.
 “ In short, this Method of Planting answer’d
 “ the End you seem to desire, better than
 “ any I have seen; that is, it grew up in
 “ about eighteen Months Time to such an
 “ Height, and so fully furnish’d, that a Plan-
 “ tation

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“tation in the ordinary Way would not have
“done in less than four or five Year's Time.

“It is therefore I would advise, that you
“make your Wilderness after this Manner
“with young Plants, which must be cut pret-
“ty near the Ground at Planting, and in two
“Years or less, you may begin to draw out
“near half the Plants to be placed elsewhere
“in your Grounds; this will encourage the
“Growth of those which are left standing, by
“giving them convenient Air, and opening
“the Earth about their Roots.

“Nor will the Charge of making this Plan-
“tation be more than if you was to plant
“large Trees at due Distances; the small
“Plants, though they will be perhaps eight
“times more numerous, yet their Price will
“be in Proportion to their bigness, they will
“more surely thrive and grow than large
“Plants, and fill your Coppice much better,
“and, as I observ'd before, much more quick-
“ly than large Plants: Besides, by their be-
“ing planted so young, they will more easily
“be naturaliz'd to the Soil, and prosper three
“times as well as others that had been ma-
“ny Years growing elsewhere. We find the
“same in storing of Ponds with Fish, that
“if we stock a Pond with Spawn of a Year
“old, the Fish will be larger in five Years
“than any Fish we were to put in with them
“of three Years old; for the young Spawn
“are quickly naturaliz'd to the Water, and
“thrive more in one Year than a Fish of
“three Years old will do in nine Years, if
“he changes his Water, 'tis so hard to con-
“quer Custom.

“ I remember once a Gentleman of my
 “ Acquaintance planted a Thicket of young
 “ Plants in the Manner I recommend, and
 “ the same Year planted a Grove of Trees a-
 “ bout nine Years old ; his Thicket in less
 “ than four Years grew taller, and had much
 “ handsomer Plants in it than any in his Grove,
 “ altho’ the oldest of his Thicket Plants were
 “ not above two Years old when they were
 “ set in his Wilderness. So that six Years
 “ Growth in the Way of Planting which I
 “ propose, gives better Plants than thirteen
 “ Years, where Trees are planted in Groves
 “ the common Way ; which is, in effect, gain-
 “ ing seven Years Time compleatly, while we
 “ are passing six Years.

“ In such Coppices I think no Plant is more
 “ agreeable than the Filbert and Spanish Ha-
 “ zle, which last may be set in Nuts about
 “ October ; for I find no Nurseries which are
 “ furnish’d with them, though I have expe-
 “ rienc’d that they grow very well.

“ Neither is it necessary to plant this Cop-
 “ pice according to any Plan or Figure ; the
 “ Walks may be cut when it is grown up, and
 “ their Edges border’d with Cowslips, Prim-
 “ roses, Violets, and other wild Flowers, to
 “ make it appear more Rural ; and if there
 “ should be enclosed with it two or three
 “ Acres of Ground, to be sown with Furze
 “ or Broom, for Harbour or Shelter for Phea-
 “ sants and Partridges, it would be yet more
 “ pleasant.

“ We have Instances enough of Pheasants,
 “ tho’ they have the Liberty of the Wing,
 “ that are so tame that they will every Night
 “ return

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“ return to their own Home ; and as often as
“ they are call’d by their Keepers, they will
“ come to them : They will breed without any
“ Trouble in such a Place as I have mention’d,
“ but the young ones should be caught at a
“ Month old, and fed ; they will then live
“ upon Corn alone, and may be easily tam’d
“ and disciplin’d.

“ Nor are Partridges more difficult in their
“ Management ; I have taken them at two
“ Months old, and made them so tame and
“ familiar, that they have follow’d me every
“ where, as well about the House as without
“ Doors ; and some of them would frequent-
“ ly fly upon the Table when I have been at
“ Dinner, regardless of all Fear. This is what
“ I shall at present communicate to you ; and
“ am,

S I R,

Yours, &c.

R. Bradley.



A Letter



*A Letter to a Gentleman, concerning the
Improvement of an Acre of low wet
Ground, by Alders or Abele's.*

S I R,

YOUR Desire of my Advice, what you shall do with your Piece of Ground, which you observe lies wet, gives me an Opportunity of recommending two Ways to you of advantaging your self. The first is by planting of Alders, to be cut once in three Years for Poles, or to make a speedy Shelter ; or else to bear with Time so long as to cut at once a valuable Sum of Money from it. We must consider, that a continued Dropping will make its Way much surer than the most violent Stroke will 'do ; or, as the Case is, Money to be receiv'd every third Year, will encrease more by its Interest, and is more sure, or will improve to more Advantage than where a large Sum will only appear in twenty Years.

If

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If you chuse the first, that is, to reap a Crop every third Year, you must plant your Ground with Truncheons, or Sets of Alder, in the Spring, about thirty six in a Rod of Ground; then upon an Acre you will have five thousand seven hundred and sixty Plants; and if they take with the Ground, which they will do if it is often overflow'd, then in three Years the Lop, or their Produce in Branches, at five Shillings *per* Hundred upon the Spot, will amount to the Value of about Fifteen Pounds. So that you have five Pounds *per Annum* for your Acre. Now the Price I have set is much lower than they will sell for, and every Truncheon will bring three or four Branches the first Year, which is abundance more than I have related, and the second Cutting will give you nine or ten from every Plant; so that one may reasonably put this Plantation at ten Pounds *per Annum*, one Year with another: And then in twenty Years the Profit would be two hundred Pounds, and Part of the Money paid every third Year to be employ'd to Profit.

On the other hand, if the Ground is not subject to be overflow'd often, you may plant in it about an hundred and sixty Abele's, which, if you allow them twenty Years growth, will be worth about one hundred and sixty Pounds. Now the Plantation of Alders, in my Opinion, is like enjoying an Estate at present; and the Abele's is like having an Estate in Reversion. The Price of the Plants will be about the same Value, but the Alders

ders will cost more to plant them than the Abele's ; they will both be profitable, and it is your own Choice whether one or the other.

I am, Sir,

Your most humble Servant,

R. Bradley.



C H A P.



C H A P. V.

*Concerning the yearly Growth of Trees,
how they encrease in Value, and of the
Mischiefs attending the cutting down
the young Trees.*

To Mr. BRADLEY, F. R. S.

S I R,

“ I N your Writings you have given us some
“ Account of the Growth of a Tree, viz.
“ that the second Year the Tree is double the
“ first in Weight, and so on in a Vegetative
“ Progression : Pray let us know, in your
“ Monthly Papers, what you mean by Vegeta-
“ tive Progression ; whether the seedling Plant
“ must be twice the Weight the second Year
“ that it was the first, and the third Year twice
“ as much as it was the second ; or else, whe-
“ ther the second Year being just as much
“ more in Weight as the first Year, the third
“ Year’s Growth will add only as much more
“ Bulk and Weight to it as the first Year’s
“ Weight and Growth ; and so every Year’s
“ Growth to add a first Year’s Proportion of
“ Weight and Growth, and no more. You
“ would

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“ would oblige me, if it might suit your Con-
 “ venience, to let me know in what Proportion
 “ a Tree grows for the Planter’s Advantage.

I am, Sir,

Your most humble Servant,

R. Bosworth.

In Answer to Mr. Bosworth’s Letter concerning Vegetative Progression, I shall endeavour to explain it by a Case nearly parallel to it; which is the Encrease of Money at Interest, which improves, by gentle Degrees, in length of Time from a mere Trifle to a large Sum.

A Tree, which I shall here suppose to be an Oak, has its beginning in an Acorn, and that Acorn is often trampled upon and disregarded as invaluable; but still this Acorn, as despicable as it is in the Nut, when the Earth has hatch’d it into a Plant, becomes equal to a valuable Consideration in Money; so that an Hundred of them, of one Summer’s Growth, will sell for two Shillings and six Pence, which is for each single Plant a Farthing, and the Fractions of twenty Farthings or five Pence. This Amount of Profit is already a good Step from what, a few Months before, was esteem’d as nothing.

From hence let us rise a little higher: Suppose one thousand Acorns in the first Year’s Shoot at half a Crown per Hundred, they will bring at the Market one Pound five Shillings;

at 4. 16. p 100
 104 .. 3. 12. 0
 21 .. 3. 4. 0
 28 .. 6. 8. 0
 35 .. 12. 16. 0
 42 .. 25. 12. 0
 49 .. 38. 8. 0

at 21. 4. worth 3 a 100 but
 100 first 1. 5. 0 so 100 - -
 At .. 1. 0
 61 .. 4. 0
 81 .. 10. 0
 100 .. 1. 0 = 0.

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but that we may avoid Fractions as much as possible in this Account, let us rate the seedling Oaks only at two Shillings *per* Hundred, which will then value the Thousand just at twenty Shillings.

Here we suppose a Sum rais'd that is capable of being put to Interest; and this Sum too is rais'd from a thousand Acorns, which, without Cultivation, were a bare Meal for a Hog, and of little Worth; or had they been laid by in a Closet, or left uncultivated, their Worth of twenty Shillings would have been lost to the Nation; therefore, as far as Opportunity will give us leave, I think the Production of Trees should be encouraged; which among the many who are now promoting this Study, I hope will amount to a large yearly Profit to the Nation. *N. B.* In this Calculation, I suppose the Oaks always remain in the same Place where the Acorns were set.

The second Year they grow somewhat more than the Weight of the first Year; that is, if a Plant in the Seed Year weigh'd two Ounces, the same Plant if it is in Health this second Year, will weigh about a Dram more than four Ounces *Avoirdupois*; which is not unlike the Growth of an annual Rent of one Pound to be continually put out at Interest after the Rate of five *per Cent.* and the whole Progress of the thousand Trees in their several Years Growth, may be pretty well guess'd at by the following Table.

20. 10
10. 6
5. 3
2. 6. 1½
10 ½
5. 4.

3

*At 3 a Hundred & 1/2 per Cent
interest 1/2 per Cent*

| | | |
|--------|-----|-----|
| 3 | --- | 3 |
| 6. 1/4 | --- | 6. |
| 12 | --- | 12 |
| 18 | --- | 18 |
| 24 | --- | 24 |
| 30 | --- | 30 |
| 36 | --- | 36 |
| 42 | --- | 42 |
| 48 | --- | 48 |
| 54 | --- | 54 |
| 60 | --- | 60 |
| 66 | --- | 66 |
| 72 | --- | 72 |
| 78 | --- | 78 |
| 84 | --- | 84 |
| 90 | --- | 90 |
| 96 | --- | 96 |
| 102 | --- | 102 |
| 108 | --- | 108 |
| 114 | --- | 114 |
| 120 | --- | 120 |
| 126 | --- | 126 |
| 132 | --- | 132 |
| 138 | --- | 138 |
| 144 | --- | 144 |
| 150 | --- | 150 |
| 156 | --- | 156 |
| 162 | --- | 162 |
| 168 | --- | 168 |
| 174 | --- | 174 |
| 180 | --- | 180 |
| 186 | --- | 186 |
| 192 | --- | 192 |
| 198 | --- | 198 |
| 204 | --- | 204 |
| 210 | --- | 210 |
| 216 | --- | 216 |
| 222 | --- | 222 |
| 228 | --- | 228 |
| 234 | --- | 234 |
| 240 | --- | 240 |
| 246 | --- | 246 |
| 252 | --- | 252 |
| 258 | --- | 258 |
| 264 | --- | 264 |
| 270 | --- | 270 |
| 276 | --- | 276 |
| 282 | --- | 282 |
| 288 | --- | 288 |
| 294 | --- | 294 |
| 300 | --- | 300 |

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| | <i>Principal.</i> | | | <i>Interest.</i> | | |
|---|-------------------|-----------|-----------|------------------|-----------|-----------|
| | <i>l.</i> | <i>s.</i> | <i>d.</i> | <i>l.</i> | <i>s.</i> | <i>d.</i> |
| The first or feed- ling Year, 1000 Oaks worth | } | 01 | 00 | 00 | 00 | 01 |
| | | | | | | |
| Which Principal and Interest to- gether make | } | 01 | 01 | 00 | | |
| | | | | | | |
| The second Year, there is a Year's Growth added, which makes | } | 02 | 01 | 00 | 00 | 02 |
| | | | | | | |
| Principal and Interest of that Year is | | | | 02 | 03 | 00 |
| The third Year | | 03 | 03 | 00 | 00 | 03 |
| | | | | | 03 | 06 |
| Fourth Year | | 04 | 06 | 00 | 00 | 04 |
| | | | | | 04 | 10 |
| Fifth Year | | 05 | 10 | 03 | 00 | 05 |
| | | | | | 05 | 15 |
| Sixth Year | | 06 | 15 | 06 | 00 | 06 |
| | | | | | 07 | 01 |
| Seventh Year | | 08 | 02 | 03 | 00 | 08 |
| | | | | | 08 | 10 |
| | | | | | | Eighth |

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| | Principal. | | | Interest. | | |
|-------------|------------|-----------|-----------|-----------|-----------|-----------|
| | <i>l.</i> | <i>s.</i> | <i>d.</i> | <i>l.</i> | <i>s.</i> | <i>d.</i> |
| Eighth Year | 09 | 10 | 03 | 00 | 09 | 00 |
| | | | | <hr/> | | |
| | | | | 09 | 19 | 03 |
| | | | | <hr/> | | |
| Ninth Year | 10 | 19 | 03 | 00 | 10 | 11 |
| | | | | <hr/> | | |
| | | | | 11 | 10 | 02 |
| | | | | <hr/> | | |
| Tenth Year | 12 | 10 | 02 | 00 | 12 | 06 |
| | | | | <hr/> | | |
| | | | | 13 | 02 | 08 |
| | | | | <hr/> | | |

The Tenth Year's Growth, according to the Computation I have made, that one thousand Oaks yearly increase one first Year's Value, besides the Interest of that Money from the First Year to the Tenth, amounts to about the Sum of thirteen Pounds two Shillings and eight-pence; but when ten Years are past from the Time they first appear'd above Ground, the Trees have then got so much Strength, that their Degree of Vegetation is increas'd, so that we may add one Pound annually for ten Years, besides the Interest at five *per Cent.* that is, we may allow now two Pounds every Year for ten Years, instead of one Pound; As for Example,

—
—
—

1000 Oaks at 1000 l. each = 1000000 l.
 D d { 1000000 l. at 5 per Cent. for 10 Years = 100000 l.
 Ten

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| | Principal. | | | Interest. | | |
|--|------------|----|----|-----------|----|----|
| | l. | s. | d. | l. | s. | d. |
| Ten Years Growth } of 1000 Oaks is } | 13 | 02 | 08 | 00 | 00 | 00 |
| To which we now } add 1 l. per Ann. } | 02 | 00 | 00 | 00 | 00 | 00 |
| which makes } | | | | | | |
| In all | 15 | 02 | 08 | 00 | 15 | 00 |
| Which Sums being added together, } make the eleven Years Growth } | 15 | 17 | 08 | | | |
| Then adding 2 l. as } before, the Sum } | 17 | 17 | 08 | 00 | 17 | 10 |
| will be } | | | | | | |
| | | | | 18 | 15 | 06 |
| Twelve Years Growth 20 | 15 | 06 | | 01 | 00 | 09 |
| | | | | 21 | 16 | 03 |
| Thirteen ditto 23 | 16 | 03 | | 01 | 03 | 09 |
| | | | | 25 | 00 | 00 |
| Fourteen ditto 27 | 00 | 00 | | 01 | 07 | 00 |
| | | | | 28 | 07 | 00 |
| Fifteen ditto 30 | 07 | 00 | | 01 | 10 | 00 |
| | | | | 31 | 17 | 00 |
| To which is to be } added 2 l. } | 02 | 00 | 00 | 00 | 00 | 00 |
| ten | b | d | | Which | | |

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| | Principal. | | | Interest. | | |
|--|------------|-----------|-----------|-----------|-----------|-----------|
| | <i>l.</i> | <i>s.</i> | <i>d.</i> | <i>l.</i> | <i>s.</i> | <i>d.</i> |
| Which makes the Sixteen Years Growth | 33 | 17 | 00 | 01 | 13 | 09 |
| | | | | <hr/> | <hr/> | <hr/> |
| | | | | 35 | 10 | 09 |
| Seventeen ditto | 37 | 10 | 09 | 01 | 17 | 06 |
| | | | | <hr/> | <hr/> | <hr/> |
| | | | | 39 | 08 | 03 |
| Eighteen ditto | 41 | 08 | 03 | 02 | 01 | 04 |
| | | | | <hr/> | <hr/> | <hr/> |
| | | | | 43 | 09 | 07 |
| Nineteen ditto | 45 | 09 | 07 | 02 | 05 | 05 |
| | | | | <hr/> | <hr/> | <hr/> |
| | | | | 47 | 15 | 00 |
| Twenty ditto | 49 | 15 | 00 | 49 | 15 | 00 |
| | | | | <hr/> | <hr/> | <hr/> |

Which Sum of forty nine Pounds fifteen Shillings, the Value of one thousand Oaks of twenty Years Growth, is but a moderate Computation, if they were one with another to be bought or sold; which Price is about four Pounds ten Shillings *per* Hundred: If they were now to be cut down, it would be about the Money they would bring; but if they were to remain growing for ten Years longer, their Value in that ten Years would mount to that Height, that we shall find Occasion to repent of having ever cropt an Oak of twenty Years; for from about the twentieth

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to

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to the thirtieth Year's Growth of Oaks, their Proportion of Increase every Year is very considerable, as appears by the following Table.

| | <i>Principal.</i> | | | <i>Interest.</i> | | |
|--|-------------------|-----------|-----------|------------------|-----------|-----------|
| | <i>l.</i> | <i>s.</i> | <i>d.</i> | <i>l.</i> | <i>s.</i> | <i>d.</i> |
| The twenty Years } Growth, as above } | 49 | 15 | 00 | 00 | 00 | 00 |
| Interest of the said Sum | | | | 02 | 09 | 09 |
| Now add <i>per Ann.</i> } to the former } Allowance 1 <i>l.</i> } which makes } | 03 | 00 | 00 | 00 | 00 | 00 |
| <hr/> | | | | | | |
| The Principal, Interest, and the } Annual Addition make the } Sum of } | 00 | 00 | 00 | 55 | 04 | 09 |
| Twenty one <i>ditto</i> | 55 | 04 | 09 | 02 | 15 | 03 |
| | | | | 58 | 00 | 00 |
| Twenty two <i>ditto</i> | 61 | 00 | 00 | 03 | 01 | 00 |
| | | | | 64 | 01 | 00 |
| Twenty three <i>ditto</i> | 67 | 01 | 00 | 03 | 07 | 00 |
| | | | | 70 | 08 | 00 |
| Twenty four <i>ditto</i> | 73 | 08 | 00 | 03 | 13 | 04 |
| | | | | 77 | 01 | 04 |
| | | | | Twenty | | |

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| | Principal. | | | Interest. | | |
|---|------------|----|----|-----------|----|----|
| | l. | s. | d. | l. | s. | d. |
| Twenty five Years } Growth | 80 | 01 | 04 | 04 | 00 | 00 |
| | | | | 84 | 01 | 04 |
| Twenty six ditto | 87 | 01 | 04 | 04 | 07 | 00 |
| | | | | 91 | 08 | 04 |
| Twenty seven ditto | 94 | 08 | 04 | 04 | 14 | 05 |
| | | | | 99 | 02 | 09 |
| Twenty eight ditto | 102 | 02 | 09 | 05 | 02 | 09 |
| | | | | 107 | 05 | 06 |
| Twenty nine ditto | 110 | 05 | 06 | 05 | 10 | 03 |
| | | | | 115 | 15 | 09 |
| Thirty ditto | 118 | 15 | 09 | 05 | 18 | 09 |
| Now added per Ann. to the former Al- lowance 1%. which makes | 04 | 00 | 00 | 00 | 00 | 00 |
| The Principal, and Interest, with the Annual Additi- on make the Sum of | | | | 128 | 14 | 06 |
| | D d 3 | | | | | So |

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| | | Principal. | Interest. |
|--------------------|-----------|-----------------|-----------------|
| | | <i>l. s. d.</i> | <i>l. s. d.</i> |
| So the thirty one | } | 128 14 16 | 06 08 08 |
| Years Growth is | | | |
| worth in Money | | | |
| | | | <hr/> 135 05 02 |
| Thirty two ditto | 139 03 02 | | <hr/> 06 19 01 |
| | | | <hr/> 146 02 03 |
| Thirty three ditto | 150 02 03 | | <hr/> 07 10 01 |
| | | | <hr/> 157 12 04 |
| Thirty four ditto | 161 12 04 | | <hr/> 08 01 07 |
| | | | <hr/> 169 13 11 |
| Thirty five ditto | 173 13 11 | | <hr/> 08 13 07 |
| | | | <hr/> 182 07 06 |
| Thirty six ditto | 186 07 06 | | <hr/> 09 06 04 |
| | | | <hr/> 195 13 10 |
| Thirty seven ditto | 199 13 10 | | <hr/> 09 19 07 |
| | | | <hr/> 209 13 05 |
| Thirty eight ditto | 213 13 05 | | <hr/> 10 13 07 |
| | | | <hr/> 224 07 00 |
| | | | <hr/> Thirty |

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| | Principal. | | | Interest. | | |
|--|------------|----|----|-----------------------|----|----|
| | l. | s. | d. | l. | s. | d. |
| Thirty nine Years } Growth | 228 | 07 | 00 | 11 | 08 | 04 |
| | | | | <hr/> 239 15 04 <hr/> | | |
| Forty Years Growth of the } thousand Oaks in Principal, Interest, and gradual Addi- } tion as above, comes to | 243 | 15 | 04 | <hr/> | | |

From this Calculation we may observe, that the first Year the thousand Oaks are worth one Pound, which is two Shillings *per* Hundred; or somewhat more than a Farthing *per* Tree.

The tenth Year the thousand Oaks in a Grove may be valued at thirteen Pounds two Shillings and eight Pence, which is almost two Pence *per* Tree, or about one Pound six Shillings *per* Hundred.

The twentieth Year the same thousand Oaks will have increas'd in Value to the Sum of forty nine Pounds fifteen Shillings, which is somewhat less than five Pounds *per* Hundred; or about twelve Pence *per* Tree.

The thirtieth Years Growth of the same thousand Oaks amounts to the Value of one hundred and eighteen Pounds fifteen Shillings and nine Pence, which is about two Shillings and eight Pence *per* Tree, or near eleven Pounds thirteen Shillings, and six Pence *per* Hundred.

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From

From thirty to forty Years, the thousand Trees have that Increase of Growth, that their Sum amounts to two hundred and forty three Pounds fifteen Shillings and four Pence, which is about four Shillings and ten Pence *per Tree*, or near twenty five Pounds *per Hundred*.

The fifty Years Growth of the thousand Oaks, following the above-written Direction, comes to four hundred and seventy six Pounds three Shillings, which is near forty seven Pounds ten Shillings *per Hundred*, or about nine Shillings and four Pence *per Tree*.

This Progression is what I suppose is analogous to the Method of Growth in an Oak; and from the best Information I can get, I am apt to think, that the Parallel I have drawn will very nearly give us their Value at the several Periods of Time, from one to fifty Years; I mean as far as it concerns their Price in Plantations for Timber; for in Nurseries, I am sensible that the Oaks which are there brought up for Sale, and for transplanting, must bear a much higher Value than I have set them at, in ten or twelve Years Growth because in such a Case the Land is dear, and the Labour of Workmen very expensive; but I mean only such Oaks as proceed from Acorns in Forests, or other waste Grounds.

As for the Calculation it self, I have not meddled with the Farthings or Half-pence, because I would avoid those Fractions, which would have made the Account tedious in the working; and besides such Fractions would have render'd the Account obscure to many of my Readers: But I believe the Method I
have

have taken is not very wide from the Mark I aim'd at, of shewing the valuable Growth of an Oak, whose Vegetation is one of the slowest of any of our *English* Timbers.

For, at the tenth Year, as I have observ'd, the Use that can be made of a young Oak cannot be worth above two Pence, when the Labour of bringing it to use is consider'd; a Coul Staff, or the Handle of some working Tool, is the best Service it can be put to.

But an Oak at the twentieth Year's Growth begins to gather Substance, so that its Contents are near four times as much as it was before, and its Value in Use cannot then be rated at less than one Shilling in the Wood or the Place of Growth; nor is it worth more, as I have experienced, for a Lop-Bough of the same Bigness will not bring more than a Shilling, and therefore for present use, the young Plant cannot be said to be more valuable; though in regard it is so far advanced in its Growth towards a Timber Tree, the cutting of such a Plant is the flinging away twenty Years time, and the Inheritance to a good Sum of Money.

The other Degrees of Value and Growth in Oak Timber, I observe agrees with most of the Observations I have made upon several Plantations which are now in *England*, where I have been inform'd of the Times of setting them, as well as the Sales of Wood and Timber which I have been at: But as I think this is the first Attempt that has yet been made, in order to account for the Degrees of Growth in the Oak, I may be excus'd if it is not free from Errors. The Method by which I calculate,

calculate, seems to answer the greatest Points, and I hope will not be unworthy the Study of those who have Skill enough in Numbers, and Examples of the Growth of Trees. But by way of Caution, I must take Occasion to mention by the by, that every sort of Tree does not grow alike; we have some kinds which do not make any Figure till sixty, eighty, or an hundred Years; and others, which may return good Profit to the Owner in twenty, thirty, forty, or fifty Years; the Reason of which is the Smallness or the Largeness of the Vessels in the different Sorts; for though the Trees are of different Kinds, yet I believe they are the same with regard to the Number of Shoots, but the Smallness or Largeness of the Vessels in each Tree is the Occasion of the Largeness or Smallness of the Shoots, and consequently of the Encrease of Bulk in a Tree.

There are some Trees, which perhaps through the Largeness of their Vessels, shoot as much in one Year as some other sorts would do in six, eight, or ten Years. The *Abele*, for Example, will encrease in Weight annually five or six times as much as an Oak; but that sudden Growth of the *Abele* renders its Wood unfit for Timber, while the Oak, which grows with more Deliberation, is durable, and of lasting Use; and there seems also to be the same Proportion of Growth between the Oak and the Yew Tree, by the Accounts I have had of some of the latter in Church-Yards, which Tradition has handed to us.

But

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But it remains that I still give some other Reason why I have allow'd my Oaks this Proportion of Growth; to which I answer, that as every Year in a Tree is to produce something more than the Tree did the foregoing Year, so there are naturally provided every Year a Number of new Vessels to maintain these Shoots, which the Tree is to produce; and the annual Productions of a Tree which are first Buds only, are supply'd with Juices by means of those new Vessels, 'till they are explain'd into Branches.

So again, these Branches become pregnant with Buds, and there are always new Vessels form'd to supply them from Year to Year, or from Season to Season.

Now as the Vessels which I speak of, must have their Origin in the Root, we must suppose that the more there are of them, so much the more the Trunk or Stem of the Tree must be thickned or enlarg'd; and it is not without Reason we observe in the Trunk of a Tree cut horizontally those Rings which, we are told, are the yearly Augmentations of the Tree's Bulk, or that occasion the Encrease of the Body of the Tree. We find those Rings next to the Pith are so close set together, that they are hardly to be discovered; when, on the other hand, those which lie nearer the Bark are more and more apparent; which happens in my Opinion from a much greater Number of Vessels being framed in the later Years than were necessary to be framed in the Year's Growth of the Tree in its first Days.

But

But let us suppose a Tree, at one Year's Growth, has only four Buds, which are design'd for Shoots the second Year; these Buds must have convenient Vessels to supply them the second Year with Nourishment: And as I have observ'd in my other Works, these new Vessels are always framed before the Buds, as Roots are form'd always before a Plant shoots in its Branches; so I say, that only supposing each Bud has two of these Strings or nourishing Tubes, then a Plant of one Year from Seed has (besides its own necessary Vessels) eight auxiliary Tubes or Vessels to maintain the four Buds in their Shoots for the second Year.

The second Year the same Plant has four Shoots from the four Buds of the preceding Year, and upon every Shoot about six or eight Buds; but suppose six Buds only to a Shoot, which is an Addition of twenty four Buds, the Stem then becomes larger than it was the Year before, by forty eight Vessels which are added; and though every one of these Vessels is not larger than a single Hair, yet so many together must apparently extend the Bulk of the Trunk or Body of the Plant. *N. B.* The forty eight Vessels which I mention are according to the Allowance above of two to every Bud, and so as many Branches as are produc'd from the Buds of the second Year, which were supposed twenty four, we might allow to have about six Buds a-piece, which would be in all one hundred forty four Buds, and then the Encrease of Bulk in the Stem, if we allow two Vessels to a Bud, would be as much as two hundred and eighty times the
Thick-

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Thickness of them would fill: So the next Year every Branch will have six Buds, and an Addition of twice as many Fibres or Sap-Vessels which correspond with the Trunk, which may be easily calculated.

In order to prove the first Calculation, I would advise those Gentlemen, who are fortunate enough to have Plantations of Oaks, or any other kind of Timber, to pick out a certain Number of Trees of every sort, and at that Season, when they do not give us the Appearance of Growth, to measure them as exactly as possible; and again, after three Years are past, to measure the same Trees, in order to judge rightly of their Encrease of Bulk, by comparing one Measure with the other.

The ingenious Mr. *Holt* once told me, that he had occasionally taken the Measure of some Oaks in a Grove near *Epping-Forest*, twice within the Term of eight Years, and that he found a very considerable Encrease of Bulk in that Time had been gain'd by the few Trees he had measured; but I cannot trust enough to my Memory to relate how much it was: However, I am persuaded if any of my Readers are desirous to be inform'd of it, if they direct to Mr. *Holt* at *Layton Stone* in *Essex*, he will be generous enough to satisfy their Curiosity.

The *Abele* Tree, which I suppose is one of the quickest Growers of any useful Tree in *England*, is said to grow to good Perfection in twenty Years. I have seen some Trees of that Growth according to the Information I had from the Person who planted them, that were almost eighteen Inches Diameter in the
Stem

Stem one Foot above the Root; their Branches were very spreading: Therefore this sort of Tree should not be neglected, as it brings speedy Profit to the Proprietor; and the Oak and other Trees for great Use should be planted at the same Time, that there may be a Succession of Timber after the first twenty Years.

The *Abeles* which I mention were valued, when I saw them, at one Pound Sterling *per* Tree; and Mr. *Hartlib's* Account of the Growth of *Abeles*, is not very different from what I have mention'd; where he tells us, that the least Set of an *Abele* will grow in two, or at most in three Years above the reach of the tallest Man. And in another Place, mentions an *Abele* set, which in twelve or thirteen Years at most, was as big as his middle; and also, that in the Year 1647, two Rows of *Abele* Sets three Inches about, were planted at twenty four Foot asunder, and by the End of the Year 1650, their Boughs met cross the Walk. He likewise observes, that an *Abele* Tree at *Sion*, was lopp'd in *February*, 1651, which by the End of *October* 1652, had put out Branches as big as a Man's Wrist, some seven, and others ten Foot long.

From the foregoing Observations of Mr. *Hartlib's*, and my own, we may discover, that the *Abele* is very speedy in its Vegetation; and, I presume, that the larger the Tree is when we lop it, so much the larger will the new Shoots be that come from it; which, however the Conjecture may be reasonable, yet few have observ'd it. We might weigh and measure the Loppings of a Tree
at

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at certain Periods of Growth, and from thence judge of the Weight of the Body of a Tree. But I have said enough at present upon this Head, to explain what I aim'd at in this Chapter, and shall therefore conclude.

12 Lines to an inch.

Suppos'd an Airon grows 1st year

| | Thick. | Diam. | Perim. | Height. |
|---|--------|-------|---------|---------|
| 1 | 1 | 1 | 3.1416 | 1.0 |
| 2 | 2 | 2 | 6.2831 | 2.0 |
| 3 | 3 | 3 | 9.3247 | 3.0 |
| 4 | 4 | 4 | 12.5664 | 4.0 |
| 5 | 5 | 5 | 15.7079 | 5.0 |
| 6 | 6 | 6 | 18.8496 | 6.0 |
| 7 | 7 | 7 | 21.9911 | 7.0 |



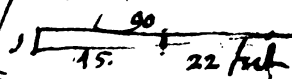
10 Lines to an inch.

Height of airon 12 ft

| Age | Thick. | Diam. | Perim. | Weight |
|-----|--------|-------|---------|--------|
| 1 | 1 | 1 | 3.1416 | 1.0 |
| 2 | 2 | 2 | 6.2831 | 2.0 |
| 3 | 3 | 3 | 9.3247 | 3.0 |
| 4 | 4 | 4 | 12.5664 | 4.0 |
| 5 | 5 | 5 | 15.7079 | 5.0 |
| 6 | 6 | 6 | 18.8496 | 6.0 |
| 7 | 7 | 7 | 21.9911 | 7.0 |
| 8 | 8 | 8 | 25.1327 | 8.0 |
| 9 | 9 | 9 | 28.2743 | 9.0 |
| 10 | 10 | 10 | 31.4159 | 10.0 |

| Age | Thick. | Diam. | Perim. | Weight |
|-----|--------|-------|--------|--------|
| 20 | 2 | 14.10 | 80 | 51.11 |
| 30 | 3 | 22.3 | 90 | 59.4 |
| 40 | 4 | 29.8 | 100 | 66.9 |
| 50 | 5 | 37.1 | 110 | 74.2 |
| 60 | 6 | 44.6 | 120 | 81.7 |
| | | | | 89.0 |

CHAP.



OF THE ART AND MYSTERY OF THE**C H A P. VI.**

Considerations upon Captain Cumberland's Invention for softening and making Timber plyable, as it is practis'd in His Majesty's Yards for Ship-building, whereby the most rude and crooked Timbers may be made streight, or Planks of any Thickness may be brought to the Bow.

WHAT I have already mention'd in this Piece, relating to the Planting and Improvement of Timber, seems to command the following Observations concerning the Use of it.

Having lately, in a particular Manner, taken a Tour about several of the Royal Docks for building of Ships, as well as some more private ones, I had the Curiosity to observe the ingenious Contrivance of Captain Cumberland, for bending of Plank and Timber by Sand-heats, which he has now brought to so great a Perfection, that even Pieces of ten Inches length, by two Foot broad, can be brought to any Bow in such a Manner as to preserve all its primitive Strength; and also crooked and furlly Sticks of Timber, of far greater

greater bigness, made streight by the same Means.

I believe it is pretty well known, that the Methods which have been used to bring Planks for Shipping, &c. to the Bow, has been done by burning, before the Captain's Invention took Place; and not only was that bending of Plank, by burning, brought about by expensive Firing, but by expensive Attendance; and then, when all was done, the Strength of such Planks was greatly impoverish'd, for by such Burning many of the binding Vessels of the Wood were broken, and became of no Service. Again, I observ'd, that large Scantlings of Timber could not be brought to bend by burning, so that the Workmen in such Cases were forced to have recourse to compass Timber, or to cutting out a Bow, or an Arch, out of a solid Piece of Timber, at more than double the Expence it would have been, if they could have bent a solid Piece to their Bow, of which the following Example is a Proof.

One Piece of Compass Timber, containing one hundred Foot, makes but one Harpin of ten Inches thick for a first Rate Man of War; but by Captain *Cumberland's* Method, a Piece of streight Timber, containing only ninety five Foot, made two Harpins of the like Substance, and one Piece of five Inches thick for the said Ship; which Difference is very considerable, if we consider that the hundred Foot Compass Timber, *i. e.* two Load, worth three Pounds ten Shillings *per* Load, is seven Pounds for one Harpin; and that by the Captain's Method we have two Harpins of the

like sort, besides a Piece of five Inches, for five Pounds fifteen Shillings; or ninety five Foot, after the Rate of three Pounds *per* Load.

The bending of Timber by the Captain's Method of Sand-Heats, has yet this Advantage in it, that it seasons the Timber, by exhaling or drawing from it all the watery or aqueous Parts, as is evident from the Sands being discolour'd when the Timbers are come to a right bending State: And these watery Parts, every one knows, are the first Occasion, as well of the rotting as of the shrinking of Timber; which last is in a particular Manner so well understood, that every one seeks for well-season'd Timber, and is content to pay considerably more for it, as it prevents a second Trouble in building, by rejoining of Parts, which in unseason'd Planks or Boards are apt to fly asunder. Nor is this all the Good we are to expect from well-season'd Timber, or Planks, or Boards; for, besides the exhaling of the watery Parts, we preserve the Resinous or Gum-like Juices in the Wood pure and unmix'd, which tend to preserve the Wood and prevent Rottenness.

One Thing which pleas'd me extremely in this Way, was the streightening of a Piece of Timber fifty Foot long, which squar'd at the Butt about two Foot, and at the Top about eighteen Inches. It was much like *Fig. I.* in Shape, but notwithstanding its crooked Form, and its extraordinary Contents, when it was saw'd through lengthways, and had been put in the Sand-Heat, being then placed upon a flat Piece of Timber, and braced down with Ropes, was afterwards with Wedges brought
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to be perfectly freight. This, I think, will be of great Use, considering how much of this uneven Timber we have in *England*, and how much has been cut to Loss for want of such reconciling Means.

Since I have observ'd these Things, I cannot help taking Notice, *en passant*, that this Way would be of extraordinary Use in building of *Cupola's*, and every Thing where Com-pals Work is requir'd, and even in the making of Wheels; which last might have the Part call'd the Nave made of two Pieces only, this bended Timber carrying a great deal more Strength in it than any that is cut out of solid Pieces, besides what may be sav'd by this Means, which will be very considerable.

But that we may have the better Idea of what I say relating to the superior Strength of the bended Timber, we may observe the following Particulars.

First, That all Timber is compos'd of two sorts of Vessels, *viz.* those which run length-ways through the Body of it, and others which are interwoven among them, of a more tender Nature, that run cross-ways. The first are like those Strings which remain in Flax or Hemp after they are dress'd, wherein is the Strength of the Plant; the other is compos'd of those Vessels which are beaten off when the Hemp or Flax is pounded; and these two sorts of Vessels are found in all Plants whatever: So that the first sort of Vessels, *viz.* the long ones, are to be preserv'd as much as possible for the Strength of Timber. The *Fig. II.* shews, by many freight Lines running from A to B, the long Vessels which I speak

of, which, as long as they remain entire and together, are like the Bundle of Rods in the Fable, not to be broken; but let any one judge, (when many of these Strings are cut, as appears by the Compass-work mark'd out between A and B) whether the Arch to be cut out of such a Piece of Wood, would not be very weak, in Comparifon of a Piece of Wood bent as I have mention'd, or as we may observe in *Fig. III.* where we may fee these Vessels of Strength reaching quite thro' the Piece which is bent to an Arch; surely then such an Arch, when it does perish, must decay all at once, because all Parts are alike in Strength; and considering how much the Lives of great Numbers of Men depend upon the Strength of those Ships they go to Sea in, the strongest Way of building Ships is to be preferr'd. But there are two Objections to this bending of Timber; the first is, That it will not always stand bent to the Bow we first bring it to: But we find no Reason for such an Objection, because that we find large Pieces of such bent Timber that have only been confin'd till they have been cold, have then had their Braces taken off, and they continued perfectly bent, as they were when they braced, without the least Guard to keep them from flying out: The Reason is, because, as I observ'd before, there remains only the Resinous Juices in the Timber, after it is heated to the Purpose; so those Juices, which harden extremely when the Wood comes to be cold, cannot give Way again, 'till they are melted, or made fluid, by an Heat equal to that which disposed the Timber first to be bent. 'Tis

as if we were to dip a Piece of Rope in melted Rozin, which will bend while the Rozin is warm, but when once it is thoroughly cold, it becomes stiff and hard, and cannot be resolv'd into its first Capacity of easy bending, 'till the Rozin is again warm'd and becomes fluid.

The second Objection is, That by bending of Timber, these Vessels, which I say support the Strength of it, are some strain'd and some broken, and that there are none of them left in the Strength they had before. If it were so, how is it then that in laying down Branches of Trees in the Ground to take Root, which bend them much more than I have mention'd; how then does it happen, that these Branches grow in all their Parts as well as they did before we bent them? Or if we bend the young Twigs of a Tree so much as to tie them in Knots, even then they do not refrain their Growth; and it is every where allow'd, that the Vessels we speak of convey Sap to every Part of the Tree, and if they were broken, the Current of the Sap must be stopp'd, and all Growth must cease; so it is evident these Vessels are neither broken nor weaken'd.

I have only to add, that of all the Experiments concerning the saving of Timber, and rightly applying it to Use, I know none which ever contributed so much to the Good of our Country; for in the Affair of Ship-building only, where the bending of one Plant used to employ four or five Men a whole Day, besides a great deal of Expence in Firing, by Captain Cumberland's Method sixteen Planks

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can be bent in a Day by two Men, with less Expence of Firing than one single Plank used to do before, besides preserving it of its full thickness and square edge, which is of very great Advantage in the cauking of Ships.



CHAP.



C H A P. VII.

Some Thoughts concerning the Preservation of Timber.

THE general Complaint of the Decay of Timber in *Great Britain*, notwithstanding several Acts of Parliament have been made for the Preservation of it, has led me to bend my Studies more particularly to the Improvement of that useful and necessary Commodity.

I observe, that where Woods are cut down, there are not always left a sufficient Number of Standils, or young Timber-Plants, to grow up in their room, as an Act of Queen *Elizabeth* directs; and in other Places, where there happens to be a due Number left standing, those are cut down, as soon as they become of any small Use, and others, which are no better than Twigs, are left to supply their Place; and this Method being, as I am inform'd, practis'd Time after Time, is one Reason why Timber decays, and our future Hopes of it is lost.

It is likewise observable, that young thriving Trees are frequently cut down by the Rabble, notwithstanding the Penalties to be inflicted upon

upon the Aggressors, directed in some late Acts of Parliament: But we do not find any of these Persons ever convicted of their Crimes, and therefore the Evil still continues; the Parties concern'd will not arraign one another, they wink at each others Faults, and so the Timber is still destroy'd.

From hence, I conceive, there can be no other Way propos'd for the Improvement and Preservation of Timber, than to make it the Interest of every one to plant and preserve it, and that I hope to do in the following Articles.

The Poor first, who make the greatest Body in the Nation, are, through their Necessities, driven sometimes to make free with their Landlord's Woods and Coppices for Fire-Wood, without being sensible of the Damage they do in cutting down the young thriving Plants or sprouting Trees in the Vigour of their Growth, to make them become Pollards; these People, as they have no Trees of their own, cannot be suppos'd capable of judging any farther of the Destruction they make, than barely what they take is of no more Value than the Price of a common Faggot, or the same Quantity of Wood sold in the Market, though perhaps the Damage done to the Owner of the Wood may be five hundred times as much, for one may spoil twenty young thriving Trees to make up a Faggot of a Penny Value.

I have observ'd in my Travels about *England*, that in many Places Wood is so scarce, that Firing is of more Value than Bread; tho' here are large Commons, yet the Country

try People have got a Notion that the Ground is barren, and will not bear Wood of any sort; but as we are assur'd by Experience, that there is no such Ground in *England*, and that every sort, how surly soever, will naturally nourish some Tree or other, so it would be for the Interest of the People inhabiting such Places, to lay up a Parcel of their common Land for Wood, one Part for Firing, and another for Timber, which should be wholly for the Use of the Commoners or Poor, and another Parcel for the sole Use of the Lord of the Mannor; unless where it is a Forest Land, and such Places where the King has a Right of Timber, and in such Case the King's Part should be planted with the rest, without Expence to his Majesty.

There is a Piece of Ground which has a promising Crop of Oaks upon it, near *Oxford*, which are so well guarded with Furze, that Cattle are turn'd into it, and do the Crop of Oaks no Harm; nor is there any Necessity of weeding the tender Plants, because they thrive better without it; tho' it was once a Paradox to me, that Plants could be crouded together without injuring one another; but it is now plain, that Plants of different Tribes draw not only different sorts of Food from the Earth, but shelter one another from hard Weather; so by this Method we save the Expence of fencing in our Plantations, and weeding them, which has been hitherto reckon'd the greatest Part of the Expence; and besides this, we have in three or four Years a Crop of Furze, which will be fit for the Poor to begin with, while their more profitable Crop is growing,
either

either for Pollard or Timber-Trees; and the Furze only will have no small Welcome in some Parts of *England*, where Firing is so scarce that even the common Weed call'd Rag-Weed is cut down and dry'd for Firing. It is to be understood, that the greatest Part of these Woods are to be rais'd from Mast or Seeds, which still contributes to lessen the Expence.

And that every Attempt of this kind may prove successful, I think there should be a proper Officer appointed to examine the Soil, and allot for it that sort of Tree that would grow best in it, and with the Justices of the Peace, or proper Inhabitants in each Place, appoint the several Parcels of Land for such Purpose; and if necessary, a small Rate made in such Parish for defraying the Expence, rather than to let the Poor give any thing towards it.

I suppose when this is done it will be as well the Interest of one as the other of the Commoners in the Parish, as well as the Lord of the Mannor, to preserve the Plantations from any Damage or Insult; and all together will take Care of the King's Part, which might be so settled, that in Case there could not be found a certain Number of Trees in Prosperity for the King's Use, the Parish should be oblig'd to make them good in Money; and so the same to the Lords of Mannors, in Case their Number, &c. of Trees were deficient.

By this Means I conclude, that the Country may be stor'd with Timber and Fire-Wood, the Poor benefited, the Estates of the Gentry improv'd,

improv'd, and the Crown enrich'd, without Expence or Trouble to the Publick.

As for the Improvement of private Estates, Mr. *John Clarke*, an eminent Merchant, tells me, that in all the Leases he grants to his Tenants, he has a Clause to oblige the Tenant to plant a certain Number of Trees yearly, or at the End of twenty one Years to pay him twenty Shillings for every one that is wanting, by which the Tenant is necessarily made the Guardian of his Plantation, and will plant and preserve his Trees more effectually than any Servant upon Hire will take the Pains to do.

It may not be improper to hint, that where we have large Tracts of Ground which are over-run with Furze, we might in such Places employ People to plant Acorns just under the green Part of the Furze, or near the Roots of them, that when they come up the Cattle may not annoy them; the Persons whose Propriety that Land is, will certainly find their Advantage by it.





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